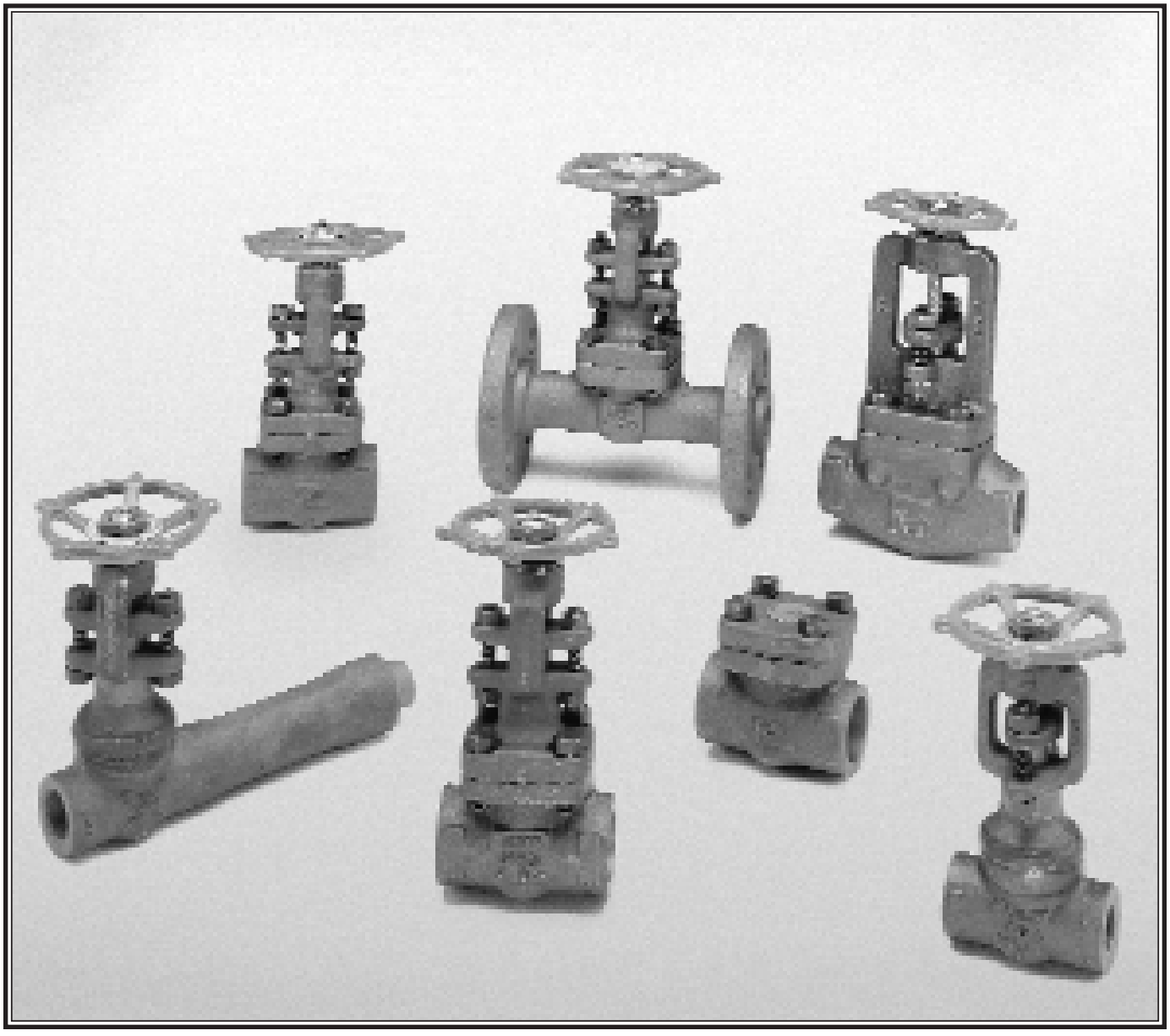
VELAN

FORGED STEEL VALVES

INSTALLATION & OPERATION MANUAL

Bolted Bonnet Gate, Globe, Piston, Ball & Swing Check Valves
Welded Bonnet Gate, Globe and Check Valves
¼–2" (8–50 mm)



Maintenance Manuals

VEL–SFVM–2004

TABLE OF CONTENTS

GENERAL INFORMATION — PAGE

GATE VALVES

GLOBE VALVES PAGE

CHECK VALVES

WELDED BONNET VALVES

LIST OF FIGURES AND TABLES

1.1 GENERAL INTRODUCTION

VELAN

This manual has been prepared by Velan engineers, designers and maintenance personnel to assist you in obtaining many years of satisfactory service from your forged steel valves. It will also assist you in restoring your valve to the best working condition with a minimum of time and expense.

Velan valves are designed and manufactured based on many years of research and product development and are constantly being improved. Before beginning any major work, we recommend that you read this booklet carefully at least once to understand the valve's physical condition.

Please note that if you do not understand the reason for the service problem, we suggest that you get in touch with your local Velan representative or call the Customer Service Manager for technical assistance.

Before beginning any major work, we recommend that you carefully check the nameplate on the valve and record the figure number to identify the type and size of valve. See the "Essential Features of Velan Valves" form on the following page for an explanation of Velan "Figure Numbers".

I INTRODUCTION

1.2 ESSENTIAL FEATURES OF VELAN VALVES

Gate, Globe and Check Valves

Type of Connection	Size of connection			Class	Type		Body/Bonnet Style			Body Material		Trim Material	
A	B			C	D		E			F		G	
F	0	8	—	2	0	7	4	B	—	1	3	M	S

e.g.: is a 2" 600 class stainless steel bolted bonnet globe valve with MS trim

A TYPE OF CONNECTION

A – Special	**C –** Combination (threaded / socket weld)	**P –** Flanged, API 605	**S –** Threaded	**W –** Socket weld
B – Butt weld	**F –** Flanged, B16.5	**R –** Flanged, ring joint	**U –** Undrilled flanges	**X –** Butt weld

B SIZE OF CONNECTION

Customers have the choice of specifying valve size as part of the valve figure number ("B") using the numbers below, or indicating valve size separately.

EXAMPLES: W**08**-2054B-02TY (valve size is part of figure number)
2" W-2054B-02TY (valve size is shown separately)

01 – ¼" (8 mm)	**02 –** ⅜" (10 mm)	**03 –** ½" (15 mm)	**04 –** ¾" (20 mm)	**05 –** 1" (25 mm)	**06 –** 1¼" (32 mm)
07 – 1½" (40 mm)	**08 –** 2" (50 mm)				

C CLASS

0 – 150	**2 –** 600 or 800	**4 –** 2500	**6 –** 400	**8 –** 1690	**X –** Special
1 – 300	**3 –** 1500	**5 –** 4500	**7 –** 900	**9 –** 2680	

D TYPE

01 – Flow control	**06 –** Full port gate	**10 –** Continuous blowdown	**15 –** Instrument	**21 –** Boiler blowoff	**34 –** Tilting disc check
02 – Ball check	**07 –** Stop globe	**11 –** Swing check	**17 –** IREB gate	**22 –** Pressure relief	**99 –** Special
03 – Piston check	**08 –** Stop check		**18 –** Extended body gate	**23 –** Double disc gate	
05 – Conventional port gate	**09 –** Needle				

E BODY / BONNET STYLE

4 – Vertical	**7 –** Y-pattern (45° inclined two-piece)
5 – Angle	
6 – Y-pattern (inclined	**8 –** Elbow down)

A – Special	**R –** Forged bolted bonnet bellows seal	**T –** All welded bellows seal
B – Bolted bonnet (forged)		**W –** Welded bonnet
D – Diaphragm	**S –** Y-pattern bellows seal (non-rotating stem)	**Y –** Bonnetless (rotating stem)
E – Extended bonnet (cryogenic)		**Z –** Bonnetless (non-rotating stem)

F BODY MATERIAL

01 – Special	**09 –** Chr. moly, F9, C12	**14 –** Stainless steel, F316L, CF3M	**20 –** Inconel	**25 –** LCB	**31 –** LCC	**35 –** 254 SMO
02 – A105, WCB	**10 –** Stainless steel, F316H/F316(1)	**15 –** Stainless steel, F347, CF8C	**21 –** Hastelloy	**26 –** LF2	**32 –** Duplex stainless steel F51	**36 –** F321 H
04 – Chr. moly, F5, C5	**11 –** Stainless steel, F304, CF8	**16 –** Stainless steel, F304H	**22 –** Titanium	**27 –** LF3/LC3		**37 –** Incoloy
05 – Chr. moly, F11, WC6	**12 –** Stainless steel, F304L, CF3	**18 –** Stainless steel, F321	**23 –** Alloy 20	**28 –** F317		
06 – Chr. moly, F22, WC9	**13 –** Stainless steel, F316(1), CF8M	**19 –** Monel	**24 –** LF1	**29 –** F317L	**34 –** F91	

G TRIM MATERIAL

	CODE	WEDGE / DISC SEATING SURFACE (2)	SEAT SURFACE (2)	STEM
	AA	Special	Special	Special
	TY	CA15	Stellite 6	410
	TS	Stellite 6	Stellite 6	410
	MY	CF8M or 316	Stellite 6	316
	MS	Stellite 6	Stellite 6	316
	XY	Monel	Stellite 6	Monel
	XX	Monel	Monel	Monel
	HC	Hastelloy C	Stellite 6	Hastelloy C
NACE H_2S SERVICE	NA(3)	13% Chrome HRC 22 max.	Stellite 6	13% Chrome HRC 22 max.
NACE H_2S SERVICE	NB(3)	Stellite or CF8M	Stellite 6	316 or 630
NACE H_2S SERVICE	NC(3)	Monel	Stellite 6	Monel or Monel K

(1) Material Code "10" F316H/F316 has a minimum carbon content of 0.04 and is to be used if temperatures are over 1000°F (538°C). Forged F316, Material Code "13", is not suitable for temperatures above 1000°F (538°C) as it is dual certified (F316/F316L).

(2) Base material may be same as body or same as trim at manufacturer's option.

(3) NA, NB and NC trims are for NACE service and are supplied with bolting with maximum hardness of Rc. 22. NS code is used for special NACE trim and details must be specified on order.

Valve Type		Low Emissions Figure Number Designation
Standard Packed Valves	Gate or globe	Add a one-digit suffix to the figure number: **0** - for live-loading, double packing and leak-off **2** - for live-loading only **3** - for double packing and leak-off

Example: *W05-3054B-02TY-0 is 1" 1500 class carbon steel bolted bonnet gate valve with TY trim, live-loading, double packing and leak-off.*

2.1 RECEIVING INSPECTION

All valves must be examined for signs of damage that may have occured during transportation. Any damage should by analyzed and a report should be issued. Serious damage should be reported to your local Velan representative or to the Customer Service Department so that a suitable arrangement for repairs can be made without delay.

2.2 STORAGE

Valves can be stored at any temperature in a sheltered area but must be protected from contamination by dirt or the elements. The valve is shipped with end protectors on the inlet and outlet which should stay in place until the valve is ready to be installed. Before installation, the end protectors must be removed and connections must be checked for cleanliness. Visible foreign matter must be removed from end connections of weld-end valves. The weld end must be cleaned with a suitable solvent, such as acetone or alcohol. Do not use bearing solvents containing fluoride or chloride.

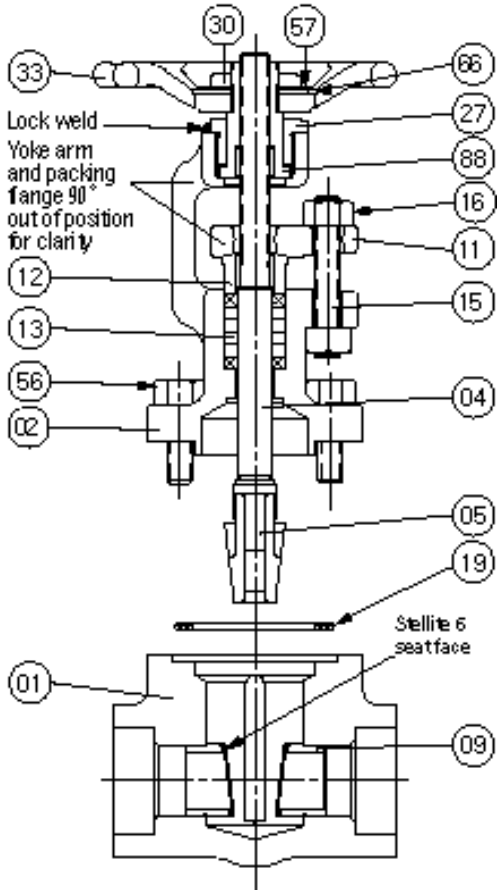
2.3 SPECIAL INSTRUCTIONS FOR GATE VALVES

The flow through gate valves can be from either end. There may be exceptions to this if bypass piping is welded to the valve body or pressure relief hole is drilled in one side of the valve gate. Check your piping layout drawing to ensure correct position and direction of flow. Gate valves should be installed and welded into the pipeline with the wedge or disc in the fully closed position. If the valve is left open or partially open, it could distort and leak during operation. Also, leaving the valve in a fully closed position helps prevent weld spatter from falling directly onto the mating faces of the seats. The preferred orientation of a gate valve is upright. The valve may be installed in other orientations, but any deviation from vertical is a compromise. Installation upside down is not recommended because of possible dirt build-up in the bonnet.

NOTE: Gate valves should not be used for throttling to control the flow, they are normally fully open or fully closed. If left in partially open position could result in severe damage to body seats, wedge, stem and guide rails.

2.4 SPECIAL INSTRUCTIONS FOR GLOBE VALVES

Globe valves are usually installed with the inlet below the valve seat *(Figure 2.4)*. This should be verified to prevent incorrect installation. For particularly severe throttling service, it is recommended that the valve be installed so that the flow enters over the top of the seat and goes down through it. This maintains the valve in a more stable condition, minimizes wear and reduces the potential noise level. Valve operation is also easier because reduced torque is required to close the valve.



PARTS DESCRIPTION

01	- Body	**16**	- Gland nut
02	- Bonnet	**19**	- Spiral wound gasket
04	- Stem	**27**	- Yoke bushing
05	- Wedge	**30**	- Handwheel nut
09	- Seat	**33**	- Handwheel
11	- Packing flange	**56**	- Cap screw or stud and nut
12	- Gland bushing	**57**	- Washer
13	- Packing ring	**66**	- Nameplate
15	- Gland stud	**88**	- Stem nut

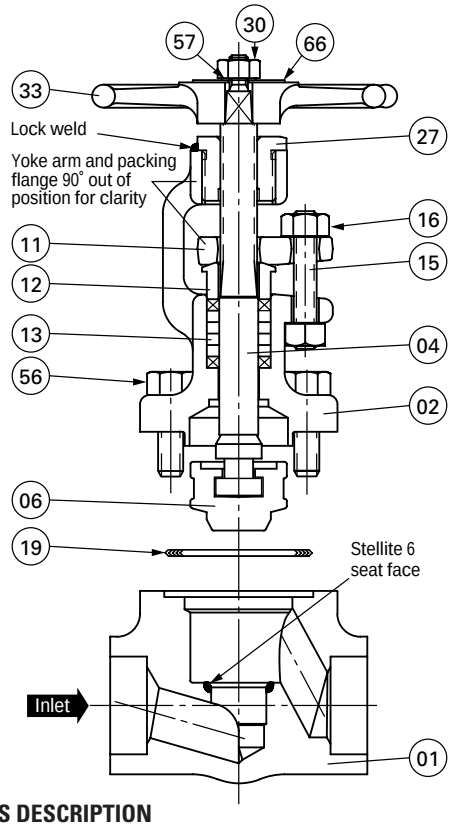
Figure 2.3 *Bolted bonnet gate valve*

IMPORATANT: Generally all small forged valves 1/4" to 2" have the body seats swaged in. Exception to this rule the following valves have the seats seal welded:

1. Nuclear valves of all classes and material used.
2. Navy valves of all classes and materials used.
3. Motor or pneumatic actuator valves of all classes and materials used.
4. Commercial valves:

   A- 2" full bore 800 class valves and all 1500 and 1690 class valves in F5, F9, F11, F22 F91 and stainless steel types.

   B- All 2500 and 4500 class valves and all materials used.



PARTS DESCRIPTION

01	- Body	**16**	- Gland nut
02	- Bonnet	**19**	- Spiral wound gasket
04	- Stem	**27**	- Yoke bushing
06	- Disc	**30**	- Handwheel nut
11	- Packing flange	**33**	- Handwheel
12	- Gland bushing	**56**	- Cap screw or stud and nut
13	- Packing ring	**57**	- Washer
15	- Gland stud	**66**	- Nameplate

Figure 2.4 *Bolted bonnet globe valve*

CAUTION: Globe valves should be installed and welded into the pipeline with the disc in a fully closed position to prevent damage to the valve during installation. Also, leaving the disc in a fully closed position helps prevent weld spatter from falling directly onto the mating faces of the seat and disc. Globe valves with soft-seated disc must be in the open position prior to welding into the pipeline. Installation upside down is not recommended because of possible dirt build-up in the bonnet.

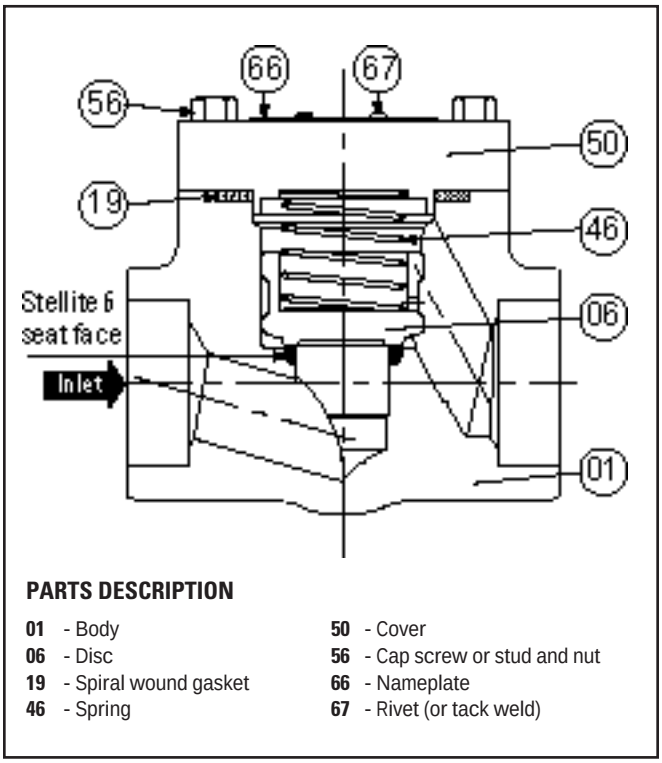
2.5 SPECIAL INSTRUCTIONS FOR PISTON CHECK, BALL & SWING CHECK VALVES

Piston, ball and swing check valves must be installed with the inlet in the direction of the arrow, as shown in *Figures 2.5A, 2.5B and 2.5C*. This should be verified before installing the valve. Placing a piston, ball and swing check valve inlet opposite the direction of flow prevents the disc (ball) from lifting and therefore prevents normal operation of the valve.

All piston and ball check valves should be installed in a horizontal pipe run with the cover up, and the angle of incline of the line should be no more than 45° from horizontal. Also, the roll angle of the valve cover should be no more than 45° from side to side *(Figure 2.5D)*. For vertical flow condition, please consult the Velan Customer Service Department. Swing check valves should be installed in an horizontal, inclined or vertical position. The roll angle of the valve cover should be no more than 45° from side to side *(Figure 2.5C).*

NOTE: All check valves should be installed at least ten pipe diameters away from upstream pumps, elbows, fittings or equipment. If closer installation is required, please consult the Velan Customer Service Department.

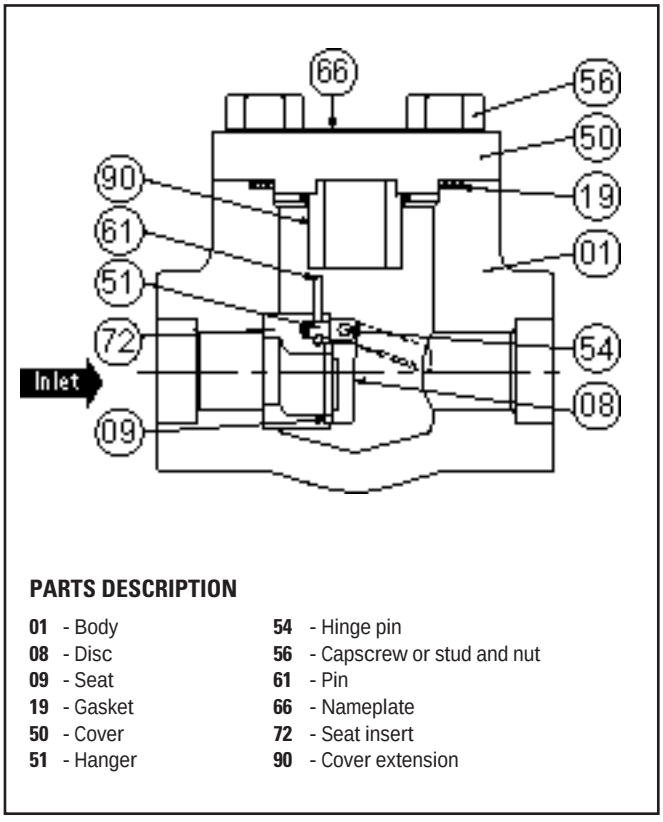
WARNING: Soft-seated piston and swing check valves should not be welded into the pipeline with the soft-seated disc in the valve. The disc must be removed and reinstalled after the valve is welded into the pipeline.



PARTS DESCRIPTION

01	- Body	**50**	- Cover
06	- Disc	**56**	- Cap screw or stud and nut
19	- Spiral wound gasket	**66**	- Nameplate
46	- Spring	**67**	- Rivet (or tack weld)

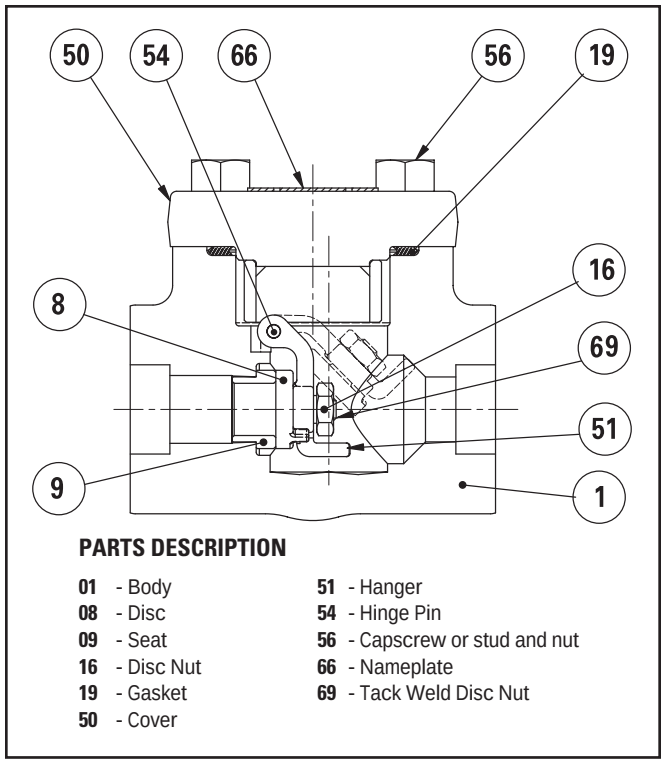
Figure 2.5A *Bolted cover piston check valve*



PARTS DESCRIPTION

01	- Body	**54**	- Hinge pin
08	- Disc	**56**	- Capscrew or stud and nut
09	- Seat	**61**	- Pin
19	- Gasket	**66**	- Nameplate
50	- Cover	**72**	- Seat insert
51	- Hanger	**90**	- Cover extension

Figure 2.5B *Bolted cover swing check valve*



PARTS DESCRIPTION

01	- Body	**51**	- Hanger
08	- Disc	**54**	- Hinge Pin
09	- Seat	**56**	- Capscrew or stud and nut
16	- Disc Nut	**66**	- Nameplate
19	- Gasket	**69**	- Tack Weld Disc Nut
50	- Cover		

Figure 2.5C *Bolted Cover Swing Check - Integral hinge*

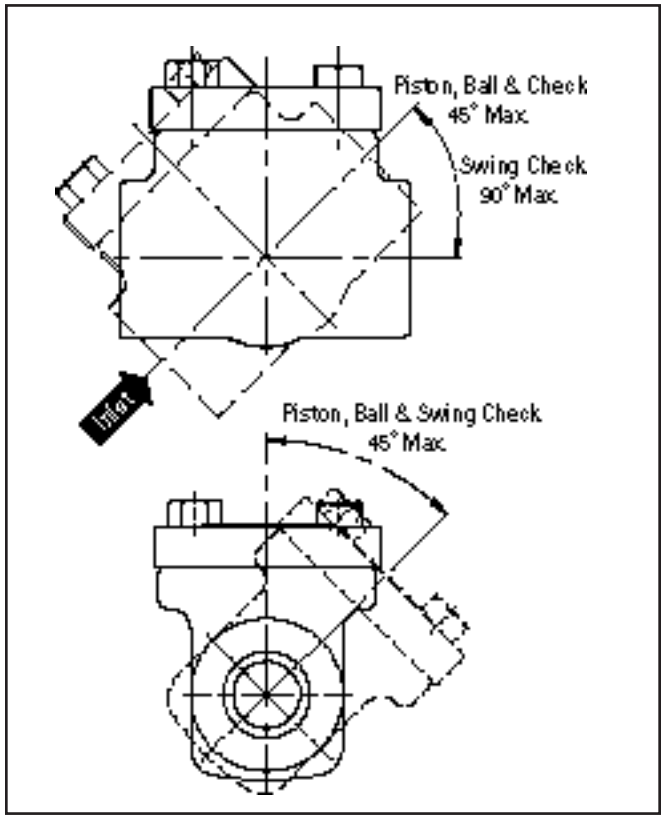


Figure 2.5D *Check valve: angle of incline and roll angle*

FOR SAFETY REASONS,

it is important to take these precautions

- *Personnel making any adjustments on the valves should wear safety equipment normally used to work with fluid in the line where the valve is installed.*
- *Before removing the yoke nut under pressure, the valve should be in fully open position in order to prevent injuries.*
- *Before removing a valve from a line, line pressure must be relieved with no exception.*
- *Velan valves can be equipped with a variety of manual gear, electric motor, hydraulic or pneumatic actuators. Generally, all pressure must be relieved from both sides of the valve before the actuator is removed.*
- *A valve in the fully open position (backseated), should not be jammed-tight (over-torqued), to avoid thermal binding. It is our recommendation that the valve be removed 1/4 turn of the handwheel from the fully open position. This will also ensure that packing tightness is verifiable. In gear-operated valves, because of the backlash, it is difficult sometimes to ensure this position.*
- *Valve standards, such as API and MSS, caution users that successful completion of a backseat test should not be construed as a recommendation by the manufacturer that a valve may be repacked while it is under pressure. The backseat may be used as a means of stopping or reducing packing leakage until the packing can be replaced under no pressure. Removal of packing with the valve under pressure is at the owner's risk.*

4.1 OPERATION

4.1.1 General

All valves should be checked before being put into operation and should be inspected regularly during operation. Prompt attention should be paid when trouble arises. As a general rule, valves should be subjected to scheduled maintenance.

4.1.2 Smoothness of Operation

Stem threads, stem nuts and other working components outside the fluid area should be lubricated frequently (at least once every six months). Specific lubricants and frequency of application are shown in *Table 4.2*.

IMPORTANT: Excessive handwheel effort can indicate the following:

1. Improperly lubricated or damaged valve stem.
2. Valve packing compression too tight *(see Table 4.1.2 for torques)*.
3. Faulty or damaged valve parts.

4.1.3 Seat Tightness and Closing Torques

Even a new valve with seating faces lapped to perfection and a full seat-wedge or disc contact will be pressure-tight only if sufficient stem load is applied. The minimum stem load for each size of valve varies with operating pressure in order to seat the valve properly. Slight over-torquing will not damage the valve.

CAUTION: Do not use "cheaters" on the handwheel.

Table 4.1.2 *Packing flange nut torques for gate or globe valves (graphite ribbon or PTFE packing)*

				GATE VALVES		GLOBE VALVES	
SIZE IN	SIZE (mm)	CLASS	STUD SIZE	TORQUE lb•in	TORQUE (Nm)	TORQUE lb•in	TORQUE (Nm)
¼–½	(8–15)	150–800	¼–20UNC	24	(2.7)	24	(2.7)
¼–¾	(8–20)	900–1690	⅜–16UNC	45	(5.1)	90	(10.2)
½–1	(15-25)	2500	7⁄16–14UNC	150	(16.9)		
¾–1	(20-25)	150–800	5⁄16–18UNC	40	(4.5)	50	(5.6)
1	(25)	900–1690	7⁄16–14UNC	100	(11.3)	130	(14.7)
1¼–1½	(32–40)	150–800	⅜–16UNC	85	(9.6)	85	(9.6)
1¼–1½	(32–40)	2500	7⁄16–14UNC	130	(15.3)		
1¼–2	(32–50)	900–1690	7⁄16–14UNC	145	(16.4)	130	(14.7)
2	(50)	150–800	⅜–16UNC	85	(9.6)	90	(10.2)
2	(50)	2500	7⁄16–14UNC	160	(18.1)		

NOTE: *For other sizes and packing materials, contact the manufacturer.*

4.2 RECOMMENDED LUBRICATION

Table 4.2 *Recommended lubrication*

PART	LUBRICATION	APPLICATION	FREQUENCY
Stem threads	Exxon: Ronex MP, Castrol MP or equivalent MP group (up to 650°F) Ronex Extra duty 2 (above 650°F)	Directly to threads	When threads appear dry
Yoke nut	Exxon: Ronex MP, Castrol MP or equivalent MP group (up to 650°F) Ronex Extra duty 2 (above 650°F)	Inject through grease fitting at hub of yoke	Concurrently with stem thread lubrication
All threaded parts except stem and yoke nut	- Anti-seize compound No. 425-A (Crane) or equivalent - Nickel Anti-Seize to MIL-A-90TE or MOLYKOTE P37	Thin coat on threads	On valve assembly only

Recommended lubricant subject to change without notice.

5.1 PACKING CHAMBER LEAKAGE

5.1.1 General *(Figures 2.3 and 2.4)*

If moisture or dripping occurs around the stem (04) or the gland bushing, the following points must be investigated before removing the packing rings (13).

CAUTION: For safety reasons, the valve must be depressurized before removing packing (13) or dismantling gland nuts (16).

1. Check if the packing flange bolting is torqued to the correct torque as shown in *Table 4.1.2*.
2. Make sure the gland bushing (12) is not binding against the packing chamber wall or stem (04).
   If so, open valve to backseat position and firmly tighten up on backseat. Loosen the gland nuts (16) and realign the gland bushing (12). Retighten the packing flange (11) with the gland nuts (16), a little at a time on each side, then torque down to the correct torque as shown in *Table 4.1.2*.
3. After retightening, cycle the valve three to five times and retighten gland nuts (16) after each cycle until fully consolidated to original torque value *(Table 4.1.2)*. Slacken the gland nuts (16) slightly if torque is too high. If steps 1 to 3 do not stop leakage, proceed with the removal and replacement of packing rings (13).

5.1.2 Packing Ring Removal on line – Use of Backseat

For safety reasons, follow warning instructions in *Section III* before replacing packing rings on line. The valve must be depressurized.

1. Remove the packing flange nuts and, if fit with live-loading, remove Belleville spring washers.
2. Lift packing flange and gland bushing as high as possible and secure.
3. For braided packing rings: *Figures 5.1E and F* use special flexible removal tools (cork screw tip) *Figure 5.1A* screw into the packing ring and pull out.

   For graphite ribbon packing *Figure 5.1E and F* with special "C" saw tool *Figure 5.1B* cut through the packings, apply downward pressure as you work the tool in a back and forth motion. Blow out packing remains using instrument air or suck out with a vaccum cleaner. Care must be taken not to scratch the stem or the walls of the packing chamber during the removal of the packing rings.
4. If the valve is equipped with a leak-off pipe, there is a lantern ring after the third packing ring. To remove the lantern ring, insert two hooks into the holes at the top of the lantern ring and pull out.
5. After the lantern ring is lifted, the last four packing rings can be removed using the procedure described in step 3.

   NOTE: The use of packing removal tools can facilitate packing removal and save considerable time see *Figure 5.1A and 5.1B*.

5.1.3 Repacking with Uncompressed Packings

Velan generally uses two types of packings: pre-formed graphite ribbon continuous ring and braided graphite, or PTFE. The packing procedure is basically the same for both types of packing.

Before inserting the packing ring (13A), check the stem (4) and the packing chamber wall to make sure there is no damage. Scratches up to 0.005 in (0.13 mm) can be removed by polishing the surface with an extra fine emery cloth or by machining skimcut.

Figure 5.1A *Flexible packing removal tool cork screw tip*

Figure 5.1B *"C"-saw packing removal tool*

Graphite ribbon packing may be cut as shown in *Figure 5.1C* to facilitate insertion into bonnet chamber.

1. Repacking valves using "packing consolidation method".
   a) Insert one braided packing ring, followed by intermediate graphite packings and one last braided packing ring *refer to Figure 5.1H*. Lower the gland bushing and check for bushing positive engagement.

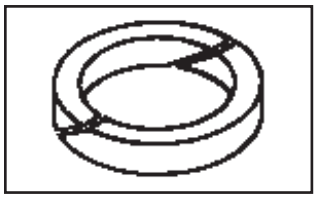


Figure 5.1C *Graphite ribbon packing*

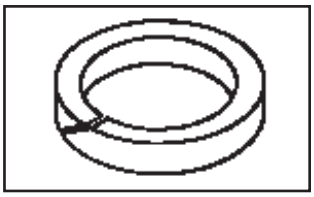


Figure 5.1D *Braided graphite packing ring*

NOTE: As a rule of thumb ⅛" (3.2 mm) min. engagement of the gland bushing inside the packing chamber is required *(Figure 5.1B)*.

b) Torque down the gland bolts to torque values shown in *Table 4.1.2*.

c) Cycle the valve approximately the length of the packing chamber. First open then close and retighten the gland bolts to appropriate torque values. Repeat this step approximately four, five times until the packings become fully consolidated (no more loss of torque)

NOTE: For motor operated valves (mov) use mov manual override handwheel to cycle open & close.

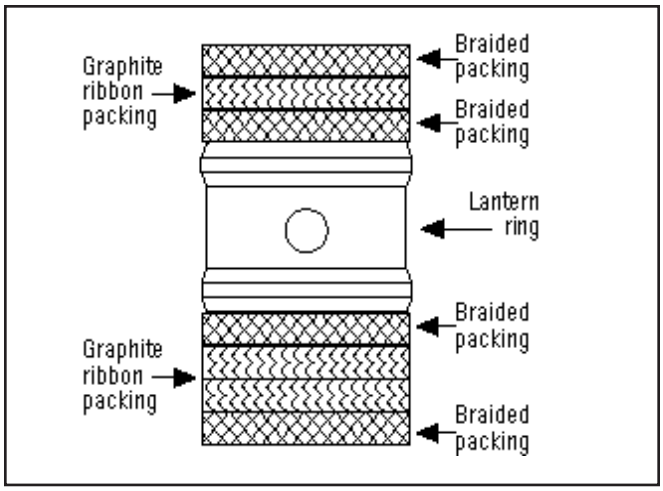


Figure 5.1E *Lantern ring configuration*

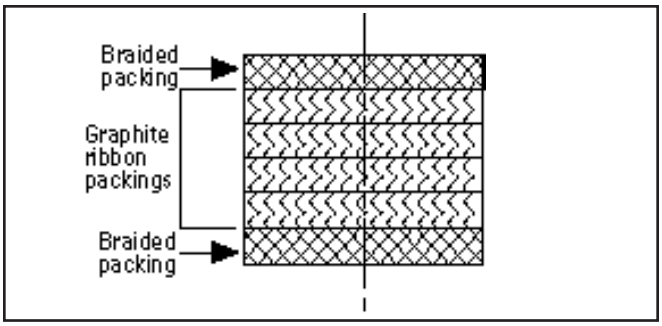


Figure 5.1F *Six packings shown*

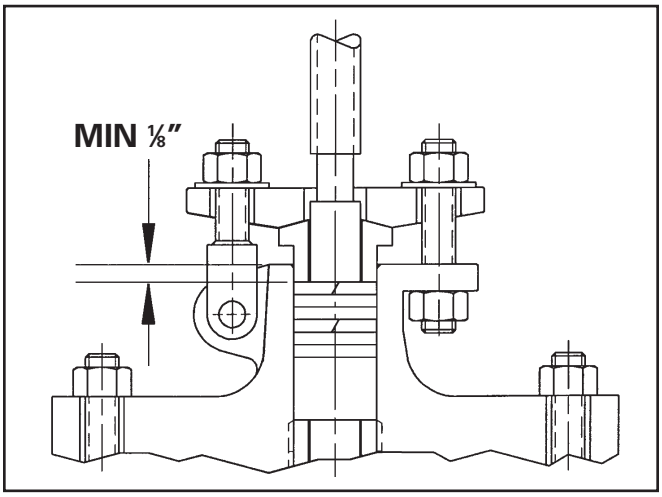
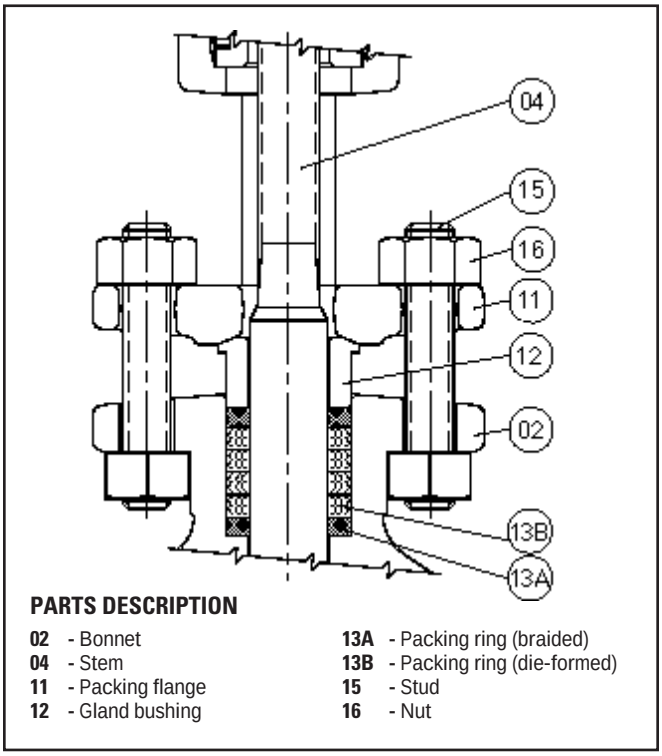


Figure 5.1G *Six packings installed*



PARTS DESCRIPTION

02	- Bonnet	**13A**	- Packing ring (braided)
04	- Stem	**13B**	- Packing ring (die-formed)
11	- Packing flange	**15**	- Stud
12	- Gland bushing	**16**	- Nut

Figure 5.1H *Packings installed*

5.1.5 Packing Torques

1. Clean all gland studs (15) and gland nuts (16). Visually inspect all threads to ensure removal of all foreign matter, rust, corrosion, burrs and previous lubricant.
2. Liberally cover the stud threads and the female threads of the nuts with anti-seize compound FEL-PRO C5-A or approved equivalent.
3. With gland nuts (16) hand-tight, tighten them a little at a time on each side, then torque down to the correct torque in accordance with the valve type, size and pressure class, as shown in *Table 4.1.2*.
4. Values given in *Table 4.1.2* are approximate for standard Velan valves. Whenever possible, refer to the Project Engineering drawing for a particular valve and its torque.

5.2 BODY-BONNET JOINT TIGHTNESS

5.2.1 General *(Figures 2.3, 2.4, 2.5A and 2.5B)*

To maintain the joint tightness of a factory-tested bolted bonnet valve, it is essential to exert sufficient bolt tension at all times by having the proper torque on the nuts. The original torque might be lessened due to vibration, relaxation of material caused by frequent temperature and pressure fluctuations, or by creep in high-temperature applications. It is recommended that the gasket joint be inspected for leakage periodically. The joint bolt tension should be checked at approximately one-year intervals.

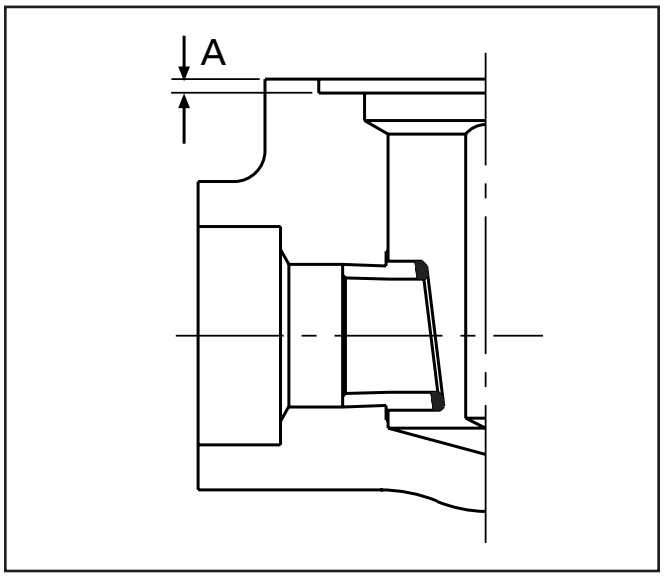


Figure 5.2A *Gasket recess*

5.2.2 Body-Bonnet Bolt Torquing

The recommendations in this section are for ideal conditions. Due to the many interacting tolerances, some latitude must be allowed in the acceptance standards as follows:

The spiral wound gasket (19) may be fully compressed (zero gap between interfaces of the joint) at 110% of the torque given in *Table 5.2*. The following criteria should be used *(see Figure 5.2A)*.

The bolt torque is satisfactory if:

a) The spiral wound gasket is fully compressed at 90% of the recommended bolt torque, provided that 100 percent torque is finally applied.

b) The spiral wound gasket is fully compressed at 100 percent torque.

c) The gap between the interfaces of the joint is not more than 0.003" (0.08") after 125 % torque has been applied and the bolts have been slackened individually and retorqued at 100% torque.

Gasket recess "A" dimension *(Figure 5.2A)*
0.085 – 0.090" (2.15 – 2.30 mm)

Gasket thickness
⅛" (3.2 mm) nominal

NOTE: Bonnet machining does not control gasket compression. Any repair to the body recess should maintain the "A" dimension.

5.2.3 Torque Procedure

1. Clean all studs and nuts and inspect all threads to ensure removal of all foreign matter, rust, corrosion, burrs and previous lubricant.
2. Liberally cover the cap screw (stud) threads and surface under the nut head with anti-seize compound FEL-PRO C5-A or approved equivalent. Also lubricate the female threads of the nuts. Wipe off, with approved solvent, any excess lubricant that may adhere to the steel parts. Approved solvents for this work are acetone, alcohol or Freon PCA.

   NOTE: The use of other solvents is not recommended.
3. With bolts hand-tight, follow the bolt-tightening sequence shown in *Figure 5.2B*. The sequence depends upon the number of bolts employed and the sketch shows only one possible tightening sequence. The bolts must be torqued to the recommended values shown in *Table 5.2*.

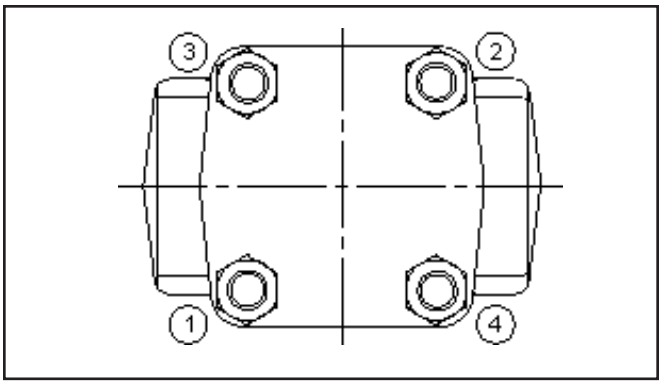


Figure 5.2B *Bolt tightening sequence*

Table 5.2 *Torque values (100%) for body-bonnet bolting*

Bolt Size	Bolting Material	
	B7, 630 B8M2, 8M	660
5/16 – 18UNC	12 (16)	10 (14)
3/8 – 16UNC	20 (27)	20 (27)
7/16 – 14UNC	30 (41)	30 (41)
1/2 – 13UNC	50 (68)	45 (61)
9/16 – 12UNC	70 (95)	62 (84)
5/8 – 11UNC	95 (129)	85 (115)
3/4 – 10UNC	170 (231)	150 (203)
7/8 – 9UNC	270 (366)	240 (325)

NOTE: *1) All values lb·ft (Nm). Torque tolerance +10%.*
2) For other sizes and bolting materials, please contact the manufacturer.

5.2.4 Application of Torque

When applying the torque to the bolts, each bolt should be torqued in steps of approximately 20% of the final torque. As the final torque is approached, the required step will be much less than 20%.

CAUTION:

1. If tightening sequence is not followed, it is possible that the spiral wound gasket will not be compressed evenly, causing the body-bonnet joint to leak.
2. Over-torquing could deform the bonnet flange and cause joint leakage.
3. Do not use an impacting device to draw up the bolting on body and bonnet (cover) closures.

5.2.5 Replacement of Spiral Wound Gasket

1. The gasket seating faces (the recess in the body and the bonnet face) must first be checked for smoothness. Scratches can normally be removed with an emery cloth. The faces should then be solvent degreased and dried before assembly. Approved solvents are acetone, alcohol or Freon PCA.
2. Install new spiral wound gasket between the body and bonnet joint. The body is now ready for installation of the bonnet assembly and tightening of the bolting in accordance with the torquing procedure.

CAUTION: Valve must be partially open when torquing bolts to prevent damage to seating surface.

6.1 SEAT LEAKAGE

6.1.1 General

An indication that a valve leakage exists after a valve has been properly closed may be found by observing the pressure loss in the line on the high pressure side of the valve. In the case of hot water or steam lines, note whether the downstream pipe remains hot beyond the usual length of time. This type of leak may be the result of a distorted seat, caused by improper welding of the valve into the pipeline, or by stress-relieving temperature that may have been used during installation, or by foreign matter damage.

Leaks can also be caused by failure to close the valve tightly, resulting in high-velocity flow through a small opening. In spite of the fact that the hardfacing material (Stellite) is corrosion and erosion resistant, grooves, pit marks or other surface irregularities may still form on the mating faces. Valves which leak should be repaired as soon as possible to prevent greater damage caused by high-velocity flow.

6.1.2 Wedge Repairs: Gate Valves

1. Disassemble valve as described in *Section 6.2* and inspect the wedge and seats for scratches, pitting marks or other damage.
2. If seating faces are scratched, they quite often can be polished with very fine emery cloth on a perfectly flat surface.
3. If polishing is not sufficient, the wedge must be lapped. Slight pitting, grooving or indentation can be removed by lapping. If defects cannot be corrected by lapping, the wedge can be ground or machined. No more than 0.005 in (0.13 mm) per side should be removed. Relap the wedge after grinding (or machining).
4. A flat plate, preferably cast iron, should be used for lapping, and an abrasive lapping compound mixed with olive oil should be evenly distributed over the plate. Only light, even pressure should be applied with the wedge on the plate. Lift the wedge as often as possible to prevent accumu-lation of particles in one area and to allow for proper distribution of lapping compound.

   The lapping plate should be turned slightly every few strokes to keep a flat surface. The wedge should be lapped until seating faces are smooth. Velan recommends the use of Clover Compound (silicon carbide) Grade D or C, or an approved equivalent.
5. Thoroughly clean off the lapping compound with a suitable cleaning fluid, such as acetone or alcohol. Do not use bearing solvents containing chloride or fluoride.

CAUTION: Lapping may be slow due to the erosion-resistant surface, but too much lapping must be avoided.

6.1.3 Seat Repairs: Gate Valves

1. Automatic grinding and lapping of seat faces can be done by specialized equipment. Information on this type of equipment can be obtained from certain Velan authorized repair facilities. For further details on such operations, contact Velan *Customer Service Department.*
2. In those cases where the automatic grinding and lapping machine is not employed, seat faces must be repaired using a lapping plate. The plate should be made of cast iron if possible and should be large enough to cover the face of the seat. Apply lapping compound mixed with olive oil and distribute evenly over the plate. Lap seat by moving lapping plate in a circular motion on seat face. Lift the plate as often as possible to prevent accumulation of particles in one area and to allow for proper distribution of the lapping compound. Lap until both seats have smooth faces and then clean off the lapping compound very thoroughly with a suitable cleaning fluid such as acetone or alcohol.

6.1.4 Fitting of Repaired Parts: Gate Valves

1. After the seating faces of the wedge and/or seats have been relapped and cleaned, you must check the wedge-seat fit. Place the marked-up side of the wedge together with marked-up side of the seat. Slowly lower the wedge into the body and find the correct mating point of the faces. Use bearing blue to check seat contact. Spread a light coating of bearing on wedge seating faces, slip wedge onto the stem. Lower stem/wedge together with the bonnet. Secure bonnet with studs/nuts. With the handwheel, close the valve firmly and than open partially, remove bonnet nuts and lift entire bonnet assembly. Care should be taken that the wedge does not slip off the stem "T" head. Check wedge seating face for 100% contact as shown in *Figure 6.1A.*
2. If a part cannot be repaired, new parts must be fitted and installed. All spare part wedges can be supplied slightly oversized. They must be ground or machined and lapped as needed to fit over the full circumference of the seat. Contact Velan Customer Service Department. for ordering details.
3. *Figure 6.1A* illustrates a wedge with a full seating circumference. This must be achieved when fitting a wedge.
4. When fitting a wedge, it is also important that the wedge guide slots have sufficient clearance to allow the wedge to move freely along the wedge guides, as shown in *Figure 6.1B (top view)*. Otherwise the wedge may be prevented from making full contact with seats.

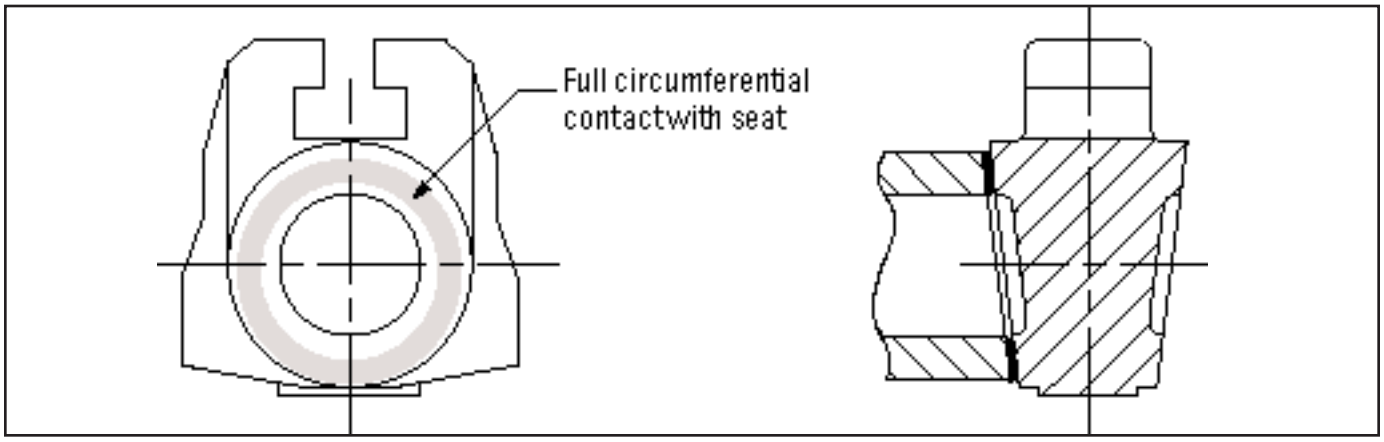


Figure 6.1A *Wedge seating face*

NOTE: *Shaded area represents the preferred seating face.*

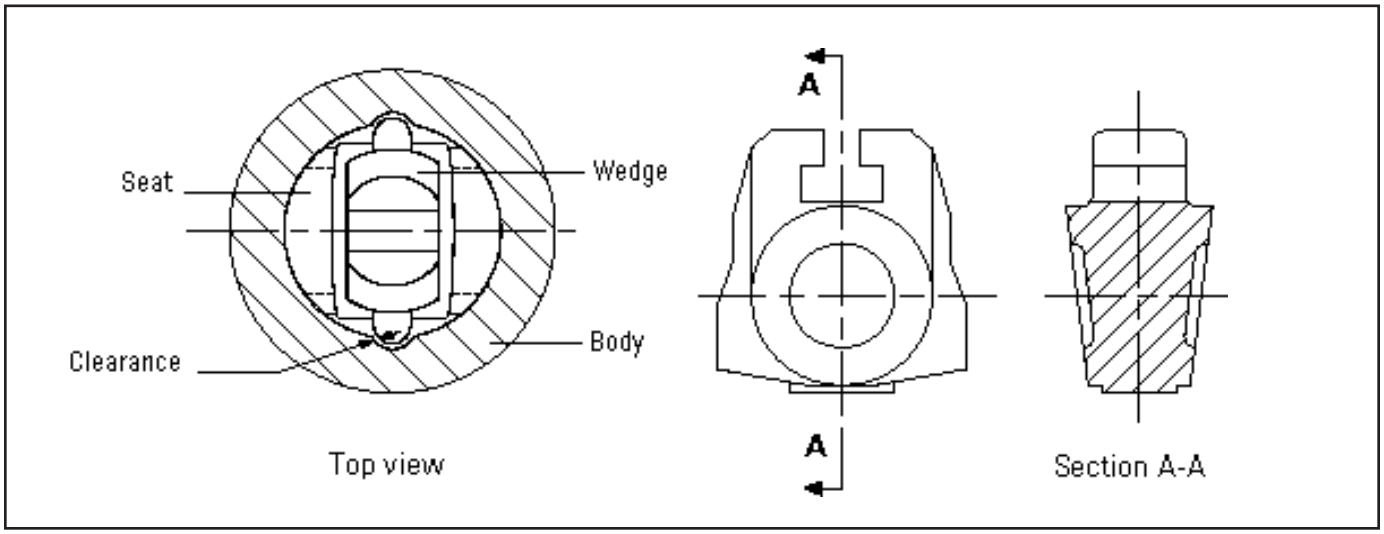


Figure 6.1B *Gate valve wedge*

6.2 DISASSEMBLY OF GATE VALVES

6.2.1 General

There are two basic ways to disassemble Velan valves: (a) total disassembly, and (b) partial disassembly to allow access to the area which requires maintenance. The appropriate method to use depends on the nature of the problem:

Total disassembly: valve internal problems, spiral wound gasket, wedge, etc.

Partial disassembly: valve top works, handwheel.

> **CAUTION**: Make sure all pressure has been relieved from both sides of the valve before starting disassembly work.

6.2.2 Total Disassembly

The disassembly instructions below cover Velan's basic designs. As general disassembly progresses, place matching marks on parts so that the same orientation of parts can be maintained at reassembly. *Refer to Figure 2.3.*

1. The valve should be in a partially open position.
2. If the valve has a leakoff pipe, it must be disconnected first. Cut the leakoff pipe approximately six inches from the bonnet side and not at the welded joint on the bonnet.
3. Remove body-bonnet cap screws (nuts) (56).

   NOTE: If a valve has been in high-temperature service for extensive periods of time, the cap screws (nuts) may be seized to the body (studs). Tight nut threads can sometimes be loosened by applying penetrating oil or heat to the nut and working it free. As a last resort, a hacksaw, cutting torch or cold chisel can be used to cut nut away from stud.
4. Once all the cap screws (nuts) are removed, the entire yoke-bonnet assembly can be lifted out of the valve body as shown in *Figure 2.3*.
5. Remove used spiral wound gasket (19).
6. The valve is now ready for inspection and repairs of wedge, seat, etc.
7. During inspection, check the condition of the body-bonnet cap screws (studs) (56). Studs may have been damaged when removing seized nuts or when lifting the yoke-bonnet assembly. If cap screws (studs) are damaged, remove and replace them.

   NOTE: When lifting the yoke-bonnet assembly, care should be taken to prevent internal parts from disengaging from the stem. The wedge (05) is attached to the stem (04) with a "T" slot, and it can slip off the stem when disengaging from the guides in the body.

6.3 REASSEMBLY OF GATE VALVES

6.3.1 General

The reassembly procedures are not as detailed as the disassembly procedures since in most cases the reverse procedure is required.

1. The most important consideration is the cleanliness of all parts. Rust and dirt should be removed from all parts with a wire brush or emery cloth. Oil and grease should be removed with suitable solvents.
2. Threaded parts (cap screws, nuts, studs) must be well relubricated. Old grease should be removed from the stem and stem nut threads before a new coat of grease is applied. Recommended lubricants can be found in *Table 4.2*.

   NOTE: Use correct lubricant for each individual part.
3. Repaired or replaced parts must be checked to make sure that repair procedures have been done and that replaced parts (e.g., packing rings, spiral gasket, etc.) have been checked for size so that they will fit into the valve you are servicing.
4. All orientation marks assigned during disassembly must be observed so that correct assembly is maintained.

7.1 SEAT LEAKAGE

7.1.1 General

An indication that a valve leakage exists after a valve has been properly closed may be found by observing the pressure loss in the line on the high pressure side of the valve. In the case of hot water or steam lines, note whether the downstream pipe remains hot beyond the usual length of time. This type of leak may be the result of a distorted seat, caused by improper welding of the valve into the pipeline, or by stress-relieving temperature that may have been used during installation.

Leaks can also be caused by failure to close the valve tightly, resulting in high-velocity flow through a small opening. In spite of the fact that the hardfacing material (Stellite) is corrosion- and erosion-resistant, grooves, pit marks or other surface irregularities may still form on the mating faces. Valves which leak should be repaired as soon as possible to prevent greater damage caused by high-velocity flow.

7.1.2 Seat Repairs: Globe Valves

1. Disassemble the valve as described in *Disassembly of Globe Valves, Section 7.2,* and inspect the disc and seat for scratches, pitting marks or other damage.
2. If there are deep pitting marks, use a cast iron lapping disc with the proper seat angle and a suitable lapping compound to roughen the surface first. With the use of a new, or already refinished original disc, you can use a finer lapping compound to finish lapping the disc and seat together.
3. a) Use a guiding plate for the stem to maintain alignment during the lapping operation. It can be made from wood or any other suitable material, to the dimensions of the gasket and the bonnet spigot. The section of the plate where the stem extends through must be 1⁄64" (0.4 mm) larger than the outside diameter of the stem.

   b) If the valve has a soft-seated disc, all body lapping must be done with a lapping disc and not with a soft-seated disc
4. Evenly distribute a small quantity of lapping compound mixed with olive oil on the two mating surfaces.
5. It is important to apply only light, even pressure when lapping seats and to rotate reciprocally. For best results, use an air or electric hand tool with adjustable speed and reciprocal movement. The lapping tool should be lifted frequently and turned to a new starting position.

7.1.3 Fitting of Repaired Parts: Globe Valves

1. After the seating faces of the disc and seat have been relapped and cleaned with a suitable cleaning fluid, such as acetone or alcohol, the results of the lapping must be verified by a blueing test to check for full circumferential contact. A blueing ink should be distributed smoothly and equally over the seating diameter of the disc. Slowly lower the part into the body and find the correct mating point of the faces.
2. When fitting the disc, it is important that the inside diameter of the body be checked for sufficient clearance to allow the disc to move freely up and down. A visual examination of the body wall is recommended. Any grooves or scratches should be polished with a fine emery cloth. It is also important to verify that the disc cannot be forced sideways against the outlet side of the waterway bore and become jammed in that position.
3. Contact between the valve disc and stem is made by a radius on the end of the valve stem *(Figure 7.1A)*, which is designed to give center loading for the disc. If particles get trapped between the end of the valve stem and the disc, the center loading of the stem can be shifted and the disc will not seat tightly. The contact surfaces of the stem and the disc must be checked first on leaky valves in order to ensure that the stem-disc contact is in proper condition.

   NOTE: A quick test is to take the stem-disc assembly and check if the disc can be rocked. The rocking will allow the disc to self-align to the seat.

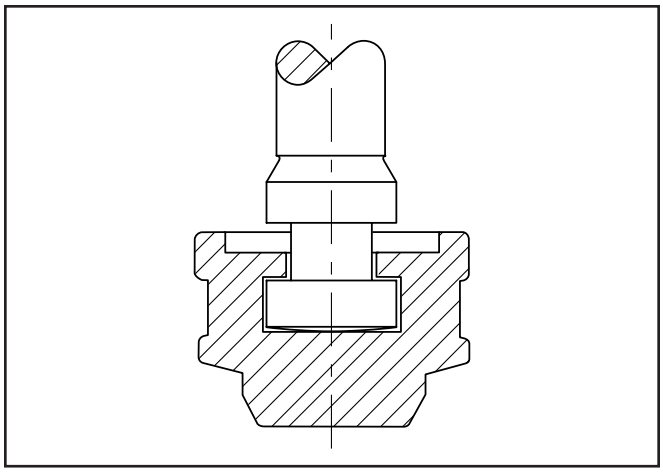


Figure 7.1A *Stem disc contact area*

7.2 DISASSEMBLY OF GLOBE VALVES

7.2.1 General

There are two basic ways to disassemble Velan valves: (a) total disassembly, and (b) partial disassembly to allow access to the area which requires maintenance. The appropriate method to use depends on the nature of the problem:

Total disassembly: valve internal problems, spiral wound gasket, disc, etc.

Partial disassembly: valve top works, handwheel.

CAUTION: Make sure all pressure has been relieved from both sides of the valve before starting disassembly work.

7.2.2 Total Disassembly

The disassembly instructions below cover Velan's basic designs. As general disassembly progresses, place matching marks on parts so that the same orientation of parts can be maintained at reassembly. *Refer to Figure 2.4.*

1. The valve should be in a partially open position.
2. If the valve has a leakoff pipe, it must be disconnected first. Cut the leakoff pipe approximately six inches from the bonnet side and not at the welded joint on the bonnet.
3. Remove body-bonnet cap screws (nuts) (56).

   NOTE: If a valve has been in high-temperature service for extensive periods of time, the cap screws (nuts) may be seized to the body (studs). Tight nut threads can sometimes be loosened by applying penetrating oil or heat to the nut and working it free. As a last resort, a hacksaw, cutting torch or cold chisel can be used to cut nut away from stud.
7. Once all the cap screws (nuts) are removed, the entire yoke-bonnet assembly can be lifted out of the valve body as shown in *Figure 2.4.*
5. Remove used spiral wound gasket (19).
6. The valve is now ready for inspection and repairs of disc, seat, etc.
7. During inspection, check the condition of the body-bonnet cap screws (studs) (56). Studs may have been damaged when removing seized nuts or when lifting the yoke-bonnet assembly. If cap screws (studs) are damaged, remove and replace them.

   NOTE: When lifting the yoke-bonnet assembly, care should be taken to prevent internal parts from disengaging from the stem. Some discs (6) are attached to the stem (4) with a “T” slot, and they could slip off the stem when it disengages from the guides in the body.

7.3 REASSEMBLY OF GLOBE VALVES

7.3.1 General

The reassembly procedures are not as detailed as the disassembly procedures since in most cases the reverse procedure is required.

1. The most important consideration is the cleanliness of all parts. Rust and dirt should be removed from all parts with a wire brush or emery cloth. Oil and grease should be removed with suitable solvents.
2. Threaded parts (cap screws, nuts, studs) must be well relubricated. Old grease should be removed from the stem and stem nut threads before a new coat of grease is applied. Recommended lubricants can be found in *Table 4.2.*

   NOTE: Use correct lubricant for each individual part.
3. Repaired or replaced parts must be checked to make sure that repair procedures have been done and that replaced parts (e.g., packing rings, spiral gasket, etc.) have been checked for size so that they will fit into the valve you are servicing.
4. All orientation marks assigned during disassembly must be observed so that correct assembly is maintained.

8.1 SEAT LEAKAGE

8.1.1 General

An indication that a valve leaks could be caused by improper welding of the valve into the pipeline, or by stress-relieving temperature that may have been used during installation.

In spite of the fact that the hardfacing material (Stellite) is corrosion and erosion resistant, grooves, pit marks or other surface irregularities may still form on the mating faces. Valves which leak should be repaired as soon as possible to prevent greater damage.

8.1.2 Seat Repairs: Piston and Ball Check Valves

1. Disassemble the valve as described in *Disassembly of Small Bolted Cover Piston and Ball Check Valves, Section 8.2.2*, and inspect the |disc and seat for scratches, pitting marks or other damage.
2. If there are deep pitting marks, use a cast iron lapping disc with the proper seat angle and a suitable lapping compound to roughen the surface first. With the use of a new, or already refinished original disc, you can use a finer lapping compound to finish lapping the disc and seat together.
3. **a)** Use a guiding plate for the shaft to maintain alignment during the lapping operation. It can be made from wood or any other suitable material, to the dimensions of the gasket and the bonnet spigot. The section of the plate where the shaft extends through must be 1/64" (0.4 mm) larger than the outside diameter of the shaft.

   b) If the valve has a soft-seated disc, all body lapping must be done with a lapping disc and not with the soft-seated disc.
4. Evenly distribute a small quantity of lapping compound mixed with olive oil on the two mating surfaces.
5. It is important to apply only light, even pressure when lapping seats and to rotate reciprocally. For best results, use an air or electric hand tool with adjustable speed and reciprocal movement. The lapping tool should be lifted frequently and turned to a new starting position.

8.1.3 Seat Repairs: Swing Check Valves

If repairs are required on the seat of a swing check valve, the procedure is the same as described in *Section 6.1.3, Seat Repairs Gate Valves*. The only difference between these seats is the angle of the seat face. They can be repaired with an automatic grinding or lapping machine or manually.

8.1.4 Fitting of Repaired Parts: Piston Check Valves

1. After the seating faces of the disc and seat have been relapped and cleaned with a suitable cleaning fluid, such as acetone or alcohol, the results of the lapping must be verified by a blueing test to check for full circumferential contact. A blueing ink should be distributed smoothly and equally over the seating diameter of the disc. Slowly lower the part into the body and find the correct mating point of the faces.
2. When fitting the disc, it is important that the inside diameter of the body be checked for sufficient clearance to allow the disc to move freely up and down. A visual examination of the body wall is recommended. Any grooves or scratches should be polished with a fine emery cloth. It is also important to verify that the disc cannot be forced sideways against the outlet side of the waterway bore and become jammed in that position.

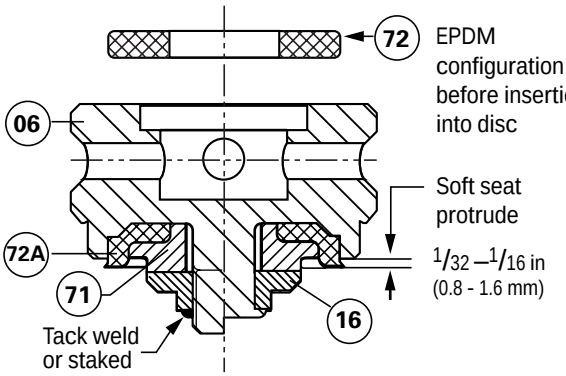
8.1.5 Supplementary Instructions for Soft-Seated Piston Check Valves

Velan soft-seated piston check discs come in three basic designs.

1. EPDM SEAT If replacing an EPDM seat *(Figure 8.1A)*, remove tack weld or staked area by grinding or filing. Carefully unscrew the disc nut (16) from the disc. Remove the seat holder (71), then the EPDM soft seat (72A). Thoroughly clean the piston disc soft seat area and disc post threads, removing any burrs and or particles of foreign matter. Install a new EPDM seat, replace seat holder and screw on the disc nut.

   NOTE: The disc nut should be tightened metal-to-metal to protrude through the soft seat 1/32 to 1/16" (0.8 - 1.6 mm). To prevent the disc nut from unscrewing, it should be tack-welded or staked.

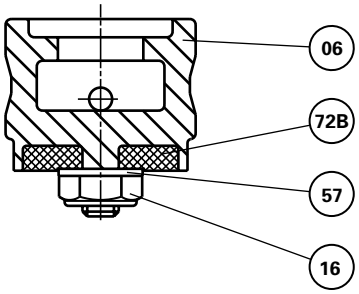
2. CTFE or PTFE SEAT *(Figure 8.1C)* If replacing a CTFE or PTFE seat, carefully unscrew the disc nut (16) from the disc. Remove washer (57) and soft seat (72B). Clean the piston disc soft seat area and disc post threads. Install a new CTFE or PTFE seat, replace washer, screw new self-locking nut with torque given in *Table 8.1.*



PARTS DESCRIPTION

06	- Disc	**71**	- Seat holder
16	- Disc nut	**72A**	- Soft seat EPDM

Figure 8.1A *Piston disc with a replaceable EPDM soft seat*



PARTS DESCRIPTION

06 - Disc
72B - Soft seat CTFE or PTFE
57 - Washer
16 - FUJILOK self-locking nut

Figure 8.1B *Piston disc with replaceable CTFE or PTFE soft seat*

Table 8.1 *Locking nut torques*

Size in	Size (mm)	Nut size	Torque lb·in	Torque (Nm)
½ – ¾	(15-20)	# 10 - 32 UNF	40	(4.5)
1	(25)	# 10 - 32 UNF	40	(4.5)
1¼ – 1½	(32-40)	¼ - 28 UNF	70	(7.9)
2	(50)	5⁄16 - 24 UNF	110	(12.4)

8.1.6 Fitting of Repaired Parts: Swing Check Valves

After the seating faces of the disc and seat have been relapped and cleaned with a suitable cleaning fluid, such as acetone or alcohol, the results of the lapping must be verified by a blueing test to check for full circumferential contact. A light coating of blueing ink should be distributed smoothly and equally over the seating surface of the disc. Slowly lower the disc with hanger into the body. Insert the hanger into the hanger seat hole, and match up with pin hole, while holding the disc away from seat insert the pin (61) slowly. Release the disc and press firmly against the seat. Remove the pin (61) *Figure 2.5B*. Pull out hanger with disc and check for positive contact.

8.2 DISASSEMBLY OF CHECK VALVES

8.2.1 General

Total disassembly: valve internal problems, spiral wound gasket, disc, etc.

CAUTION: Make sure all pressure has been relieved from both sides of the valve before starting disassembly work.

8.2.2 Disassembly of Small Bolted Cover Piston and Ball Check Valves

The disassembly instructions below cover all of Velan's small bolted cover piston (ball) check valves. As the general disassembly progresses, place matching marks on parts so that the same parts will be used at reassembly *(refer to Figures 8.2A and 8.2B)*.

1. Remove cover cap screws (nuts) (56).

   NOTE: If a valve has been in high-temperature service for extensive periods of time, the cap screws (nuts) may be seized to the body (studs). Tight nut threads can sometimes be loosened by applying penetrating oil or applying heat to the nut and working it free. As a last resort, a hacksaw, cutting torch or a cold chisel can be used to cut nut away from stud.

2. Once all the cap screws (nuts) are removed, the entire cover can be lifted off the valve body as shown in *Figures 8.2A and 8.2B.*
3. Remove used spiral wound gasket (19).
4. Lift spring (46) and piston disc or ball (06).
5. The valve is now ready for inspection and seat repairs.

6. During inspection, check the condition of the body-cover cap screws (studs) (56). Studs may have been damaged when removing seized nuts or when lifting the cover. If studs are damaged, remove and replace them as follows:

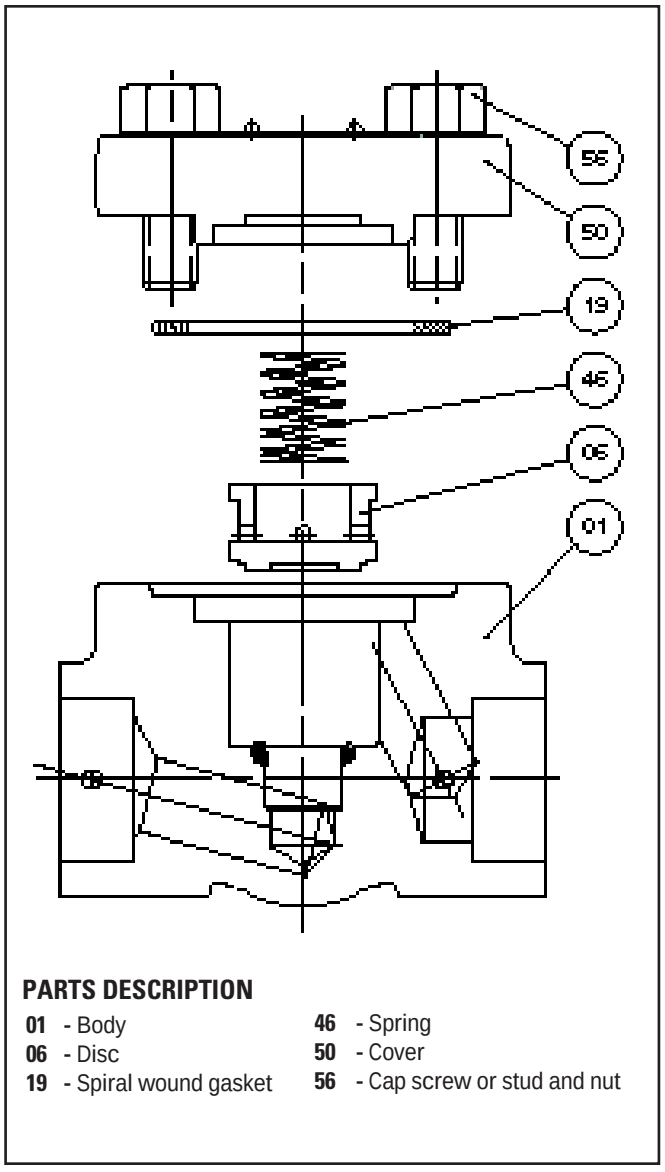
   a) Screw on two nuts.

   b) Lock the bottom nut to the top nut.

   c) Turn the bottom nut to remove the stud.

   d) Apply anti-seize compound to the new stud.

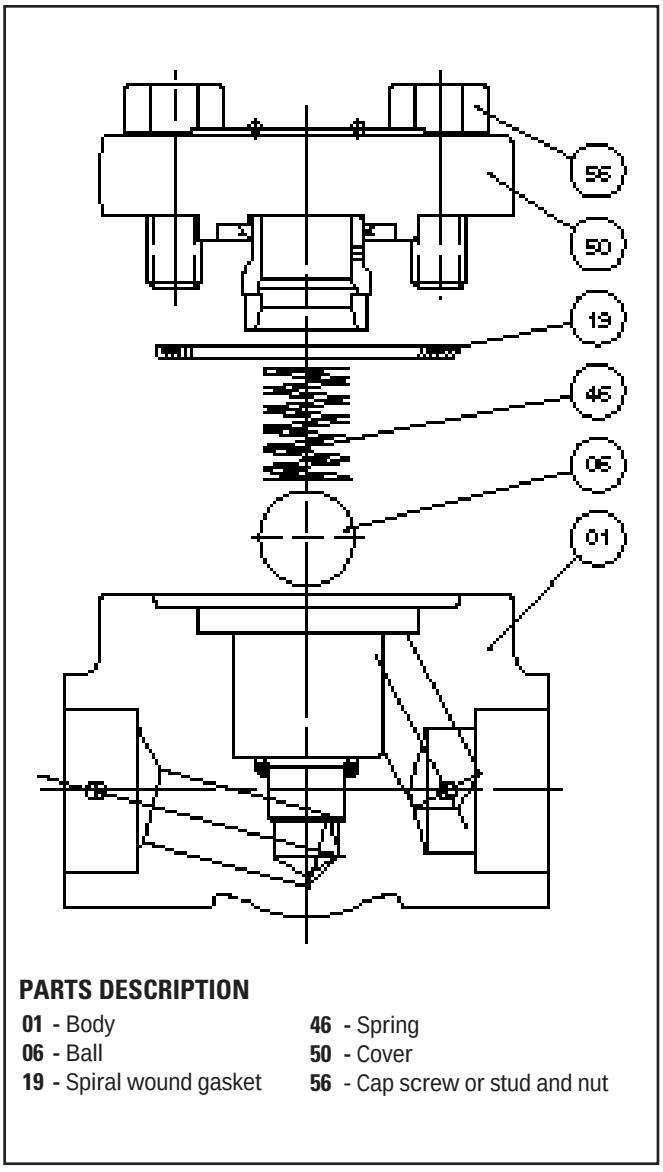
   e) Screw in the stud and tighten.



PARTS DESCRIPTION

01 - Body	**46** - Spring
06 - Disc	**50** - Cover
19 - Spiral wound gasket	**56** - Cap screw or stud and nut

Figure 8.2A *Bolted cover piston check valve exploded view*



PARTS DESCRIPTION

01 - Body	**46** - Spring
06 - Ball	**50** - Cover
19 - Spiral wound gasket	**56** - Cap screw or stud and nut

Figure 8.2B *Bolted cover ball check valve exploded view*

8.2.3 Disassembly of Swing Check Valves

The disassembly instructions below cover all of Velan's small bolted cover swing check valves, as a general disassembly progresses follow *Section 8.2.2 para. 1, 2, and 3* , refer to *Figure 2.5B Swing check valve*.

4. Remove lock pin (61).

NOTE: It may be necessary to use a pair of pliers or vise grip and pull pin while twisting back and forth. With the pin removed, pull out hanger (51) together with the disc (08). Please note, it may be necessary to twist back and forth while pulling hanger/disc towards downstream. Once the hanger and disc have been removed from valve body, the disc and hanger can be disengaged by sliding out hinge pin (54).

5. The valve is now ready for inspection and seat-disc repairs.

6. During inspection, check the condition of the body-cover cap screws (studs) (56). Studs may have been damaged when removing seized nuts or when lifting the cover. If studs are damaged, remove and replace them as follows:

a) Screw on two nuts.

b) Lock the bottom nut to the top nut.

c) Turn the bottom nut to remove the stud.

d) Apply anti-seize compound to the new stud.

e) Screw in the stud and tighten.

8.3 REASSEMBLY OF CHECK VALVES

8.3.1 General

The reassembly procedures are not as detailed as the disassembly procedures since in most cases the reverse procedure is required.

1. The most important consideration is the cleanliness of all parts. Rust and dirt should be removed from all parts with a wire brush or emery cloth. Oil and grease should be removed with suitable solvents.

2. Threaded parts (cap screws, nuts, studs) must be well relubricated. Recommended lubricants can be found in *Table 4.2*.

3. Repaired or replaced parts must be checked to make sure that repair procedures have been done and that replaced parts (e.g., spiral wound gasket, etc.) have been checked for size so that they will fit into the valve you are servicing.

4. All orientation marks assigned during disassembly must be observed so that correct assembly is maintained.

8.3.2 Reassembly of Piston and Ball Check Valves

1. Install piston disc or ball (06) and spring (46) in valve.

2. Place new spiral wound gasket (19) in recess on top mounting face of body.

3. Line up the cover (50) with the body (01) and lower into the body. It is extremely important to prevent damage to the gasket when aligning the cover.

4. Apply recommended lubricant to body-cover cap screws (studs and nuts), and then install. Tighten body-cover cap screws (nuts) in strict accordance with the torque procedure found in *Section 5.2* and *Table 5.2* of this manual.

8.3.3 Reassembly of Swing Check Valves

Install disc (08) and hanger (51) with hinge pin (54) lower into body insert hanger into seat hanger hole and line up with pin hole. Insert pin (61) and proceed with body-cover reassembly. Follow *Section 8.3.2, paragraph 2, 3 and 4* to complete assembly.

9.1 WELDED BONNET GATE, GLOBE AND CHECK VALVES

Welded bonnet valves can be repacked and the top works serviced in the same way as bolted bonnet valves. However, the servicing of the seating faces or back seat can only be achieved by removing the bonnet assembly, which is threaded into the body and welded. This section provides a method for removing the bonnet without the necessity of cutting the valve from the line *(Figs. 9.1A, 9.1B and 9.1C)*.

9.1.1 Disassembly

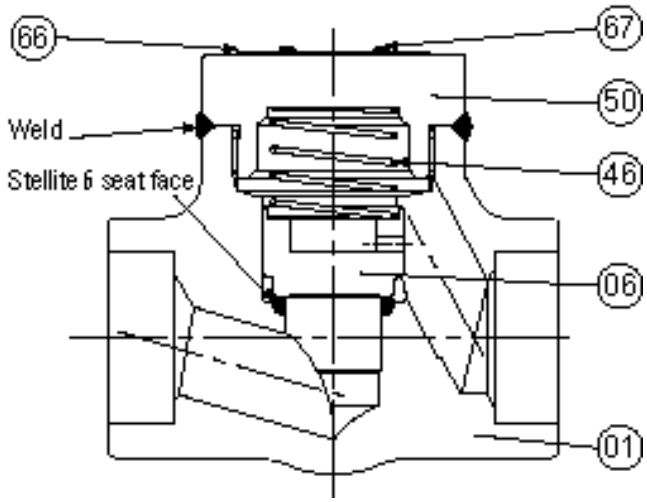
When Velan welded bonnet valves are serviced because of a damaged seat or backseat, the weld between the body and the bonnet must be carefully cut off, using an electric hand grinder with a flat cutting wheel. Once the weld is removed, the bonnet can be unscrewed from the body.

Tight body-bonnet threads can sometimes be loosened by applying penetrating oil to threads and by tapping the side of the body using a mallet while unscrewing the bonnet. If valves have been in high temperature service for extensive periods of time, the bonnet may be seized to the body, and it may be necessary to heat the body and bonnet to free them.

Servicing of internal components is the same as for bolted bonnet valves, described in *Sections V to VII.*

9.1.2 Reassembly

Relap the seats and apply blueing ink to check final results. Then tightly thread the bonnet assembly into the body and weld the body-bonnet joint in accordance with an applicable Velan welding procedure.

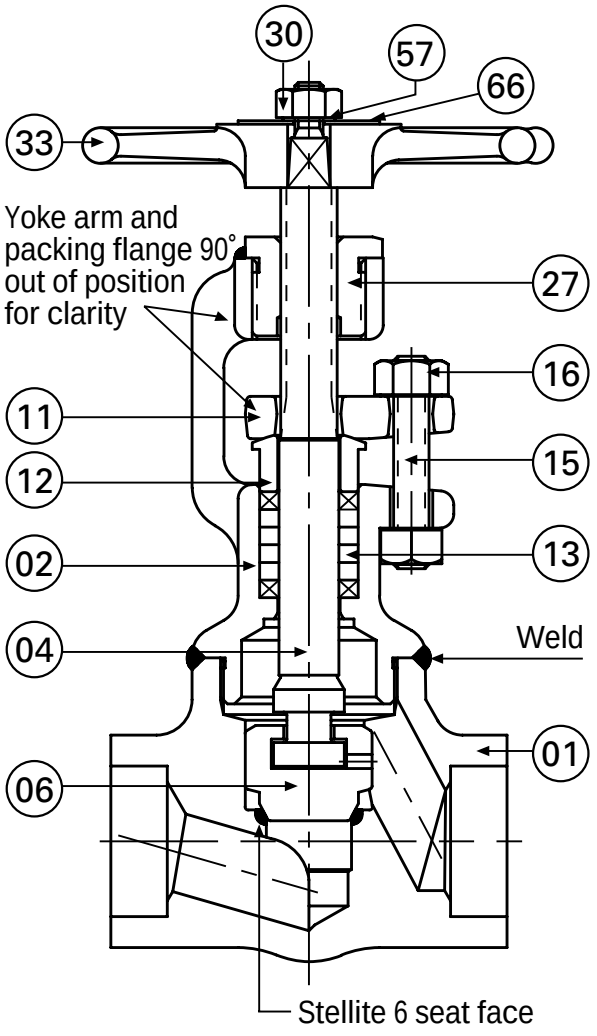


PARTS DESCRIPTION

01 - Body
06 - Disc
46 - Spring
50 - Cover
66 - Nameplate
67 - Rivet (or tack weld)

Figure 9.1A *Welded cover piston check*

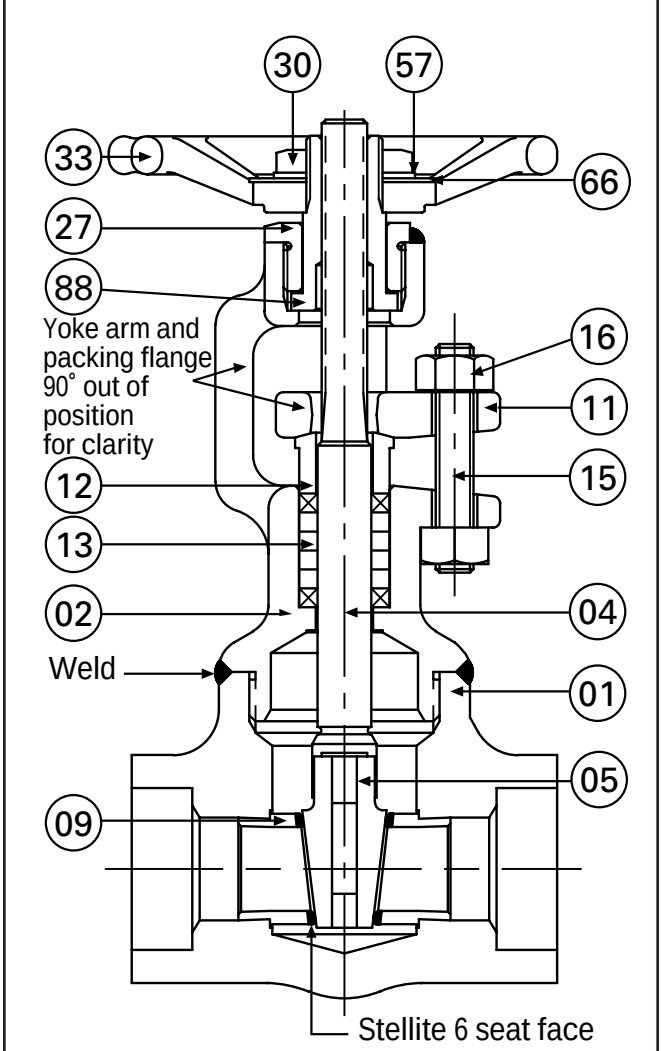
IX WELDED BONNET VALVES



PARTS DESCRIPTION

01	- Body	**15**	- Gland stud
02	- Bonnet	**16**	- Gland nut
04	- Stem	**27**	- Yoke bushing
06	- Disc	**30**	- Handwheel nut
11	- Packing flange	**33**	- Handwheel
12	- Gland bushing	**57**	- Washer
13	- Packing ring	**66**	- Nameplate

Figure 9.1B *Welded bonnet globe valve*



PARTS DESCRIPTION

01	- Body	**15**	- Gland stud
02	- Bonnet	**16**	- Gland nut
04	- Stem	**27**	- Yoke bushing
05	- Wedge	**30**	- Handwheel nut
09	- Seat	**33**	- Handwheel
11	- Packing flange	**57**	- Washer
12	- Gland bushing	**66**	- Nameplate
13	- Packing ring	**88**	- Stem nut

Figure 9.1C *Welded bonnet gate valve*

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Valve Product Line	Size in	Size mm	Pressure Class	Applicable Specifications
Forged pressure seal and bolted bonnet gate, globe and check valves	2 – 24	50 – 600	PS: ASME 600 – 4500 BB: ASME 150 – 1500	ASME B16.34
Small forged steel gate, globe and check valves	¼ – 2	8 – 50	ASME 150 – 2500	API 602, 606 ASME B16.34
Forged steel Y-pattern globe valves	½ – 4	15 – 100	ASME 900 – 4500	ASME B16.34
Cast steel gate, globe and check valves	2 – 60	50 – 1500	ASME 150 – 1500	API 600
Cast stainless steel gate, globe and check valves	½ – 24	15 – 600	ASME 150 – 300	API 603 ASME B16.34
Twin flapper wafer check valves	2 – 72	50 – 1800	ASME 125 – 2500	API 594
All stainless steel knife gate valves	2 – 36	50 – 900	150 psi	TAPPI TIS 405-8 MSS SP-81
Memory seal ball valve	¼ – 24	8 – 600	ASME 150 – 600 600 – 4000 WOG	ASME B16.34
General purpose ball valve	¼ – 12	8 – 300	Up to 300	Up to ASME B16.34
Metal-seated ball valves	½ – 24	15 – 600	ASME 150 – 4500	ASME B16.34
Butterfly valves	3 – 36	80 – 900	ASME 150-300	API 609
Bellows seal gate and globe valves	½ – 12	15 – 300	ASME 150 – 2500	ASME B16.34
Cryogenic gate, globe, check, ball and butterfly valves	⅜ – 48	10 – 1150	ASME 150 – 1500	ASME B16.34

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