



ARRAY



OPERATION & MAINTENANCE MANUAL

API 6A EXPANDING GATE VALVE



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INTRODUCTION

GATE VALVE FOR WORKING PRESSURES 3,000 THROUGH 5,000 (Figure 1)

Manually operated valves are standard with expanding split gate design and non-rising stems. Fittings are provided for body lubrication, bearing lubrication and renewal of stem packing. The wedging action of the gate provides a positive mechanical gate seat seal on both the upstream and downstream sides of the valve; however, the valve has a preferred direction of installation. The preferred direction of flow is clearly marked with an arrow on the valve body.

GATE VALVE FOR WORKING PRESSURES 10,000 THROUGH 15,000 (Figure 2)

Manually operated valves are standard with expanding split gate design and pressure balancing stems. Fittings are provided for body lubrication, seat lubrication, bearing lubrication and renewal of stem packing. The wedging action of the gate provides a positive mechanical gate seat seal on both the upstream and downstream sides of the valve; however, the valve has a preferred direction of installation. The preferred direction of flow is clearly marked with an arrow on the valve body.



Figure 1



Figure 2

Valves are also available prepared for an actuator of the customer's choice or equipped with an Array Products Pneumatic Diaphragm, Pneumatic Piston, or Hydraulic Actuator. The standard configuration for an actuated valve includes a slab gate, floating seats and a blind bonnet in place of the lower bonnet on manually operated valves. Actuator/bonnet assemblies and actuated valve assemblies also include an optional manual override device.



INSTALLATION AND OPERATING INSTRUCTIONS

INSTALLATION INSTRUCTIONS

Once an Array gate valve has been assembled and tested it is fully lubricated. Protective coatings are applied to flange seal surfaces and threads which are exposed to the environment. Gates, seats, stems and other internal parts are also coated with a lubricant such as Molybdenum Disulfide, Xylan, etc., prior to assembly. Every effort should be made to preserve the protective coatings and lubricants prior to installation.

To prevent damage to gate and seat sealing surfaces, all valves are shipped in the open position. The valve should be left in the open position until installation is complete. Should it be necessary to transport the valve, it should always be placed in the open position.

If a hydrostatic test is performed prior to installation, the valve cavity should be drained of test fluids and refilled with a suitable lubricant. CAUTION: If hydrostatic tests that exceed the working pressure are required, they must be performed with the valve in the open or partially open position.

OPERATING INSTRUCTIONS

Array expanding gate valves must be fully open or closed to properly wedge the gate segments against the seats. Once fully opened or closed, do not back off on the handwheel. Doing so will release the mechanical wedging action of the gate segments. The appropriate number of turns to operate each Array valve is shown in Table 1 and Table 2.

3,000 Through 5,000 WP	
Nominal Size (Inches)	No. of Turns
2 ¹ / ₁₆ "	13
2 ² / ₁₆ "	16
3 ¹ / ₈ "	20
4 ¹ / ₁₆ "	25
5 ¹ / ₈ "	31
7 ¹ / ₁₆ "	42

Table 1

10,000 Through 15,000 WP	
Nominal Size (Inches)	No. of Turns
1 ¹³ / ₁₆ "	12
2 ¹ / ₁₆ "	14
2 ² / ₁₆ "	15
3 ¹ / ₁₆ "	18
4 ¹ / ₁₆ "	23

Table 2



MAINTENANCE

When shipped, all Array valves are fully lubricated and serviced. Once installed, well clean up, cementing operations, hydrofrac, acidizing, etc., can displace lubricants from the body cavity. This may leave particles and fluid which can be damaging to the gate and seat sealing surfaces. It is recommended to drain, vent and lubricate valves following such operations.

A routine program of draining the valve body is the best approach to increasing the effective life of the valve. A minimum of lubrication maintenance will enhance the life and trouble free operation of the valve. Array Field Service Personnel are available to assist you with Valve Maintenance Programs.

The maintenance tools and accessories, as well as, the procedures to be followed for each model of Array valve will follow.

1. Maintenance Equipment

- 1.1. To facilitate the necessary valve maintenance we recommend the following equipment: Pressure releasing tool for Alemite grease fittings, Alemite grease gun, Alemite P/N 6713, with needle valve and adapter or equivalent.

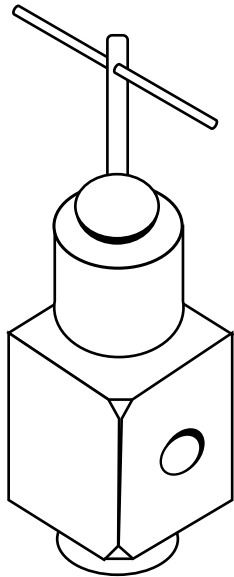


Figure 3

Safety Pressure Releasing Tool

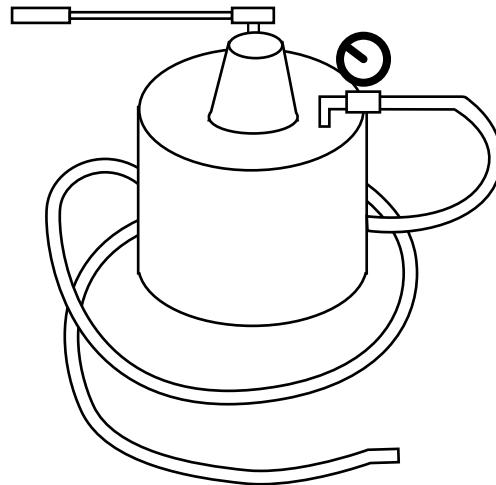


Figure 4

Alemite Grease Gun



2. Identification of Servicing Fittings

2.1. In the lubrication and servicing procedures, references to fittings may be identified and located per the following figures.

Lubrication Fitting Identification

1	Bearing Lubrication Fitting
2	Packing Injection Fitting
3	Drain Port / Cavity Lube Port
4	Seat Sealant Injection Port

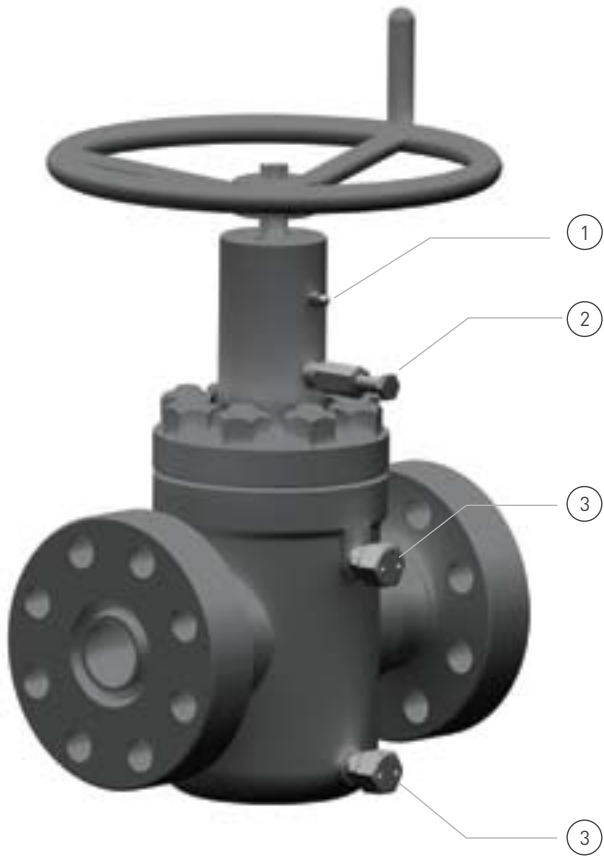


Figure 5

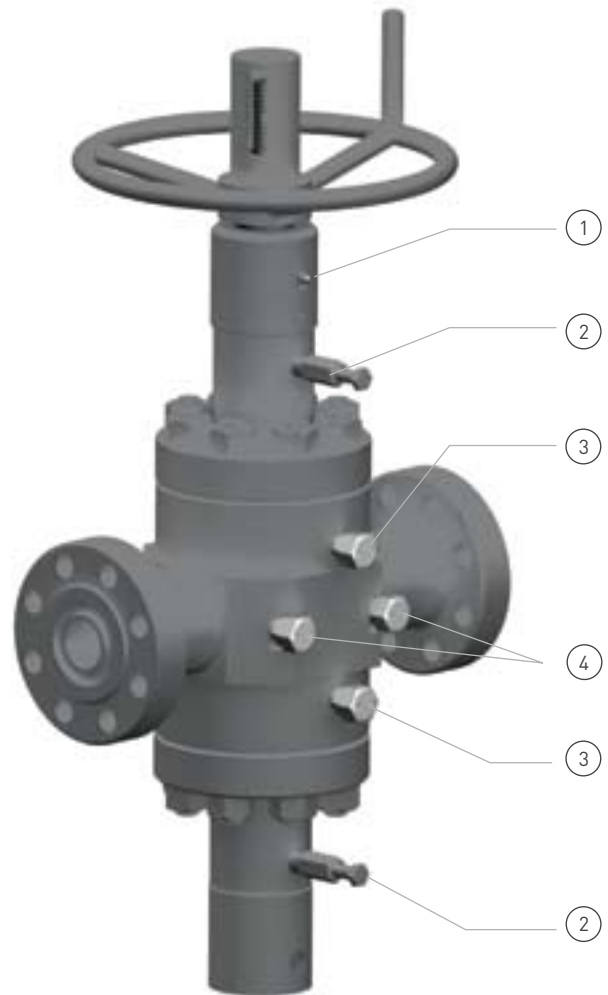


Figure 6



3. Stem Bearing Lubrication

3.1. Valves are equipped with a standard 1/8" Alemite grease fitting for stem bearing lubrication. A good grade of #3 grease is recommended for this lubrication. Only a small amount of grease is required. Over lubrication will result in leakage around the stem. **CAUTION:** Array gate valves must be removed from service to perform any work on bearings.

4. Body Lubrication

4.1. Regular body lubrication will help keep valves operating freely and prolong their service life. Generally, Desco 111 (HS) is recommended for body lubrication. Any good grade #3, #4 or #5 grade lubricant that is not soluble in the media being handled may be substituted as a body lubricant. Approximately one pound of grease per inch of valve bore size will sufficiently lubricate the valve body. It is not necessary to completely fill the valve body.

CAUTION: Lubricating pressure must not exceed the rated working pressure of the valve being lubricated. A pressure gage should be used to monitor lubricating pressure.

Each valve is equipped with two safety ball check grease fittings installed on the body of the valve. Lubrication requires the use of a safety pressure release tool and a high pressure grease gun equipped with a coupling and needle valve. The needle valve may be used to shut off flow in the event that the ball check in the fitting fails to reseal.

- 4.1.1. Operate the valve to either its fully open or fully closed position.
- 4.1.2. Remove safety caps from body grease fittings and install the pressure releasing tool to one and the grease pump to the other.
- 4.1.3. Operate the pressure release tool to bleed body pressure and leave the stinger in this position.
- 4.1.4. Inject lubricant through the other body grease fitting.
- 4.1.5. Once lubrication is complete, remove the pressure release tool and grease pump.
- 4.1.6. Reinstall the safety caps securely on both lubrication fittings.

5. Stem Packing

5.1. Plastic packing may be injected into the valve stem packing box through the stem packing fitting located in the valve bonnet in order to stop or prevent leakage that may occur around the stem or packing gland. Caution should be used if this procedure is being done while the valve is in service and under pressure. This packing is supplied in easy-to-use stick form and is available for all service conditions. A 3/4" socket with a speed or ratchet wrench is recommended for this operation.

- 5.1.1. Run the hex head stinger all the way into the stem packing fitting and then back out when you are sure that the ball check has seated. Ball check leakage can be detected through the small hole in the side of the fitting prior to completely removing the stinger.
- 5.1.2. Remove the stinger and insert one stick of packing.



5.1.3. Reinstall the stinger to inject the packing.

5.1.4. Repeat if necessary, inserting only as much packing as is required to stop any leakage. **CAUTION:** Excessive packing pressure will cause the stem to bind, making operation of the valve difficult.

6. Venting And Draining

6.1. Routine draining of valve bodies will increase valve life and reduce damage to the valve caused by accumulation of foreign matter. The accumulation of foreign matter may keep the valve from fully closing which could result in damaged seat and gate segment sealing surfaces.

6.1.1. Put the valve in a fully open or fully closed position.

6.1.2. Remove one of the body grease fitting safety caps and install a pressure release tool.

6.1.3. Screw the stinger of the pressure release tool into the fitting to bleed body pressure and allow the valve to vent or drain.

6.1.4. After venting or draining, back the stinger of the pressure release tool out to reseal the ball check.

6.1.5. If the initial draining is not sufficient, it may be necessary to repeat the procedure.

6.1.6. Once draining is completed, the valve should be lubricated (Section 4).

7. Regular Preventative Maintenance

7.1. A program of routine draining and body lubrication is the most positive way to prevent problems caused by foreign matter in the valve body. If a routine program cannot be followed, it is recommended that valves be drained at the following times:

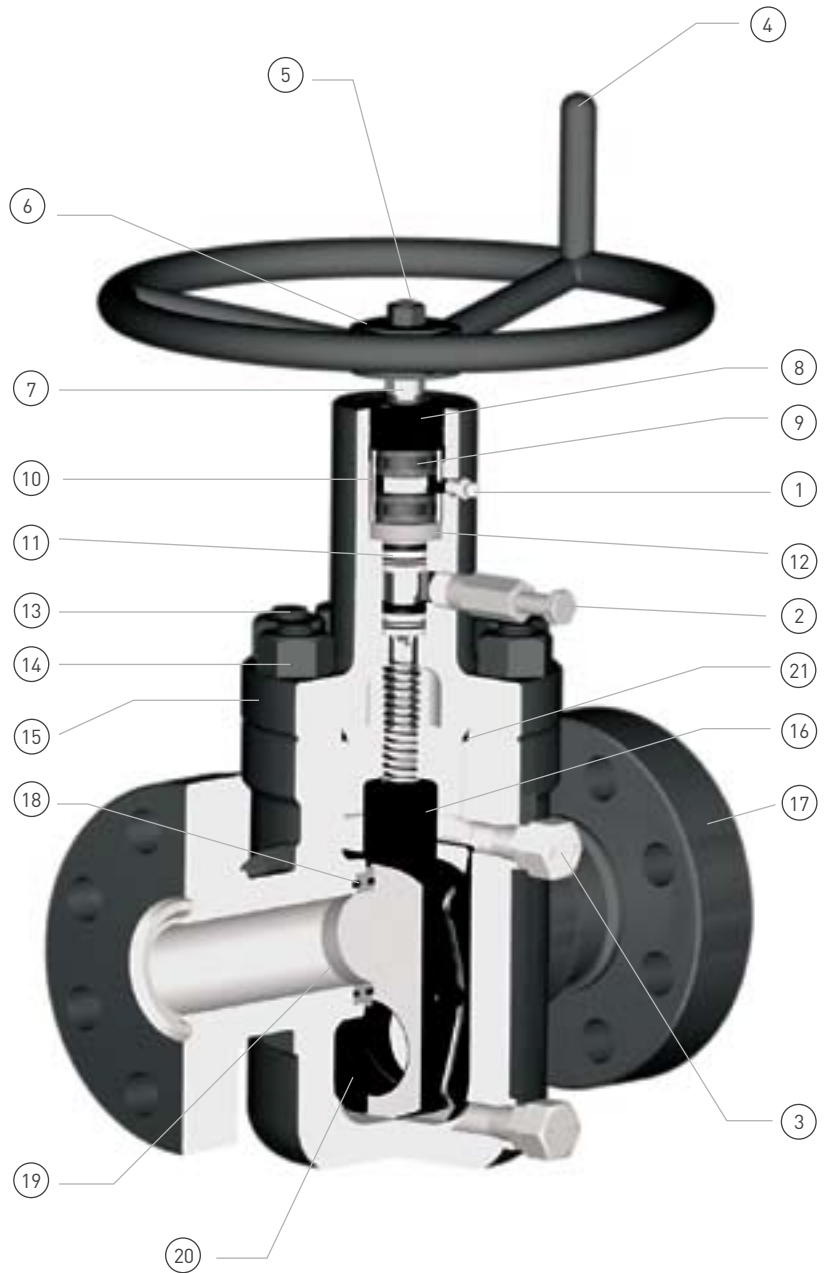
- After a well has come in and has been cleaned up.
- After any cementing or fracturing operation.
- Anytime the valve becomes hard to operate or will not fully open or close by the required number of handwheel turns. Run the hex head stinger all the way into the stem packing fitting and then back out when you are sure that the ball check has seated. Ball check leakage can be detected through the small hole in the side of the fitting prior to completely.



PARTS LIST

3,000–5,000 PSI VALVES

#	DESCRIPTION
1	Bearing Lubrication Fitting
2	Packing Injection Fitting
3	Drain Port/Cavity lube Port
4	Handwheel
5	Handwheel nut
6	Washer
7	Stem
8	Bearing Retainer Nut
9	Bearing
10	Bearing Retainer Sleeve
11	Packing Set
12	Packing Retainer Bushing
13	Stud
14	Nut
15	Bonnet
16	Gate Assembly
17	Valve Body
18	O-Ring
19	Seat Assembly
20	Gate Guide
21	Bonnet Seal Ring

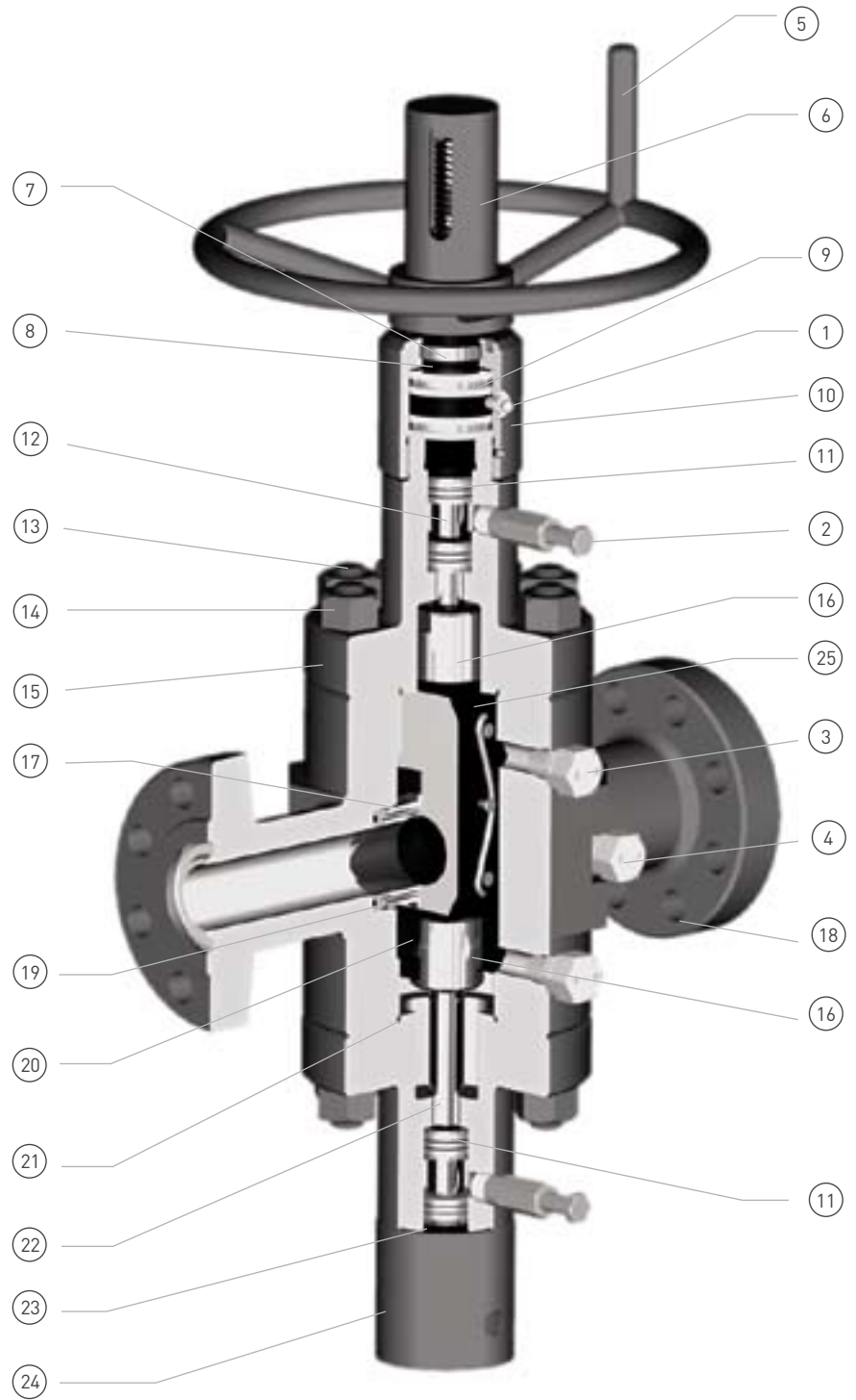




PARTS LIST

10,000–15,000 PSI VALVES

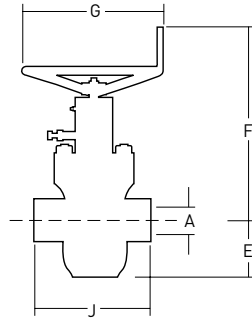
#	DESCRIPTION
1	Bearing Lubrication Fitting
2	Packing Injection Fitting
3	Drain Port/Cavity lube Port
4	Seat Sealant Injection Port
5	Handwheel
6	Upper Stem Protector
7	Bushing
8	Stem Adapter
9	Bearing
10	Housing
11	Packing Set
12	Upper Stem
13	Stud
14	Nut
15	Bonnet
16	Gate Nut
17	Seat Assembly
18	Valve Body
19	O-Ring
20	Gate Guide
21	Bonnet Seal Ring
22	Lower Stem
23	Packing Gland
24	Lower Stem Protector
25	Gate Assembly





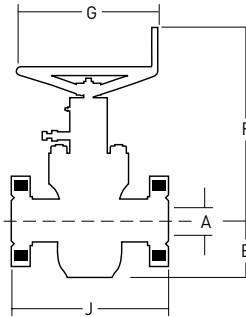
DIMENSIONAL DATA

3,000–5,000 PSI VALVES



THREADED VALVES

SIZE	Working (PSI)	A		E		F		G		J		WT	
		in	mm	in	mm	in	mm	in	mm	in	mm	lbs	kgs
2 1/16	2000,	2.06	52	4.81	122	19.25	488	11.00	279	9.62	244	90	40
	3000–5000	2.06	52	5.06	128	19.43	493	13.00	330	9.62	244	125	56
2 3/16	2000,	2.56	65	5.62	142	20.18	512	13.00	330	10.25	260	125	56
	3000–5000	2.56	65	5.93	150	20.43	519	16.00	406	10.25	260	160	72
3 1/8	2000,	3.12	79	6.93	176	22.50	571	13.00	330	11.37	288	190	86
	3000–5000	3.12	79	7.31	185	22.75	577	16.00	406	11.37	288	230	104
4 1/16	2000,	4.06	103	8.62	219	25.93	658	16.00	406	13.00	330	320	145
	3000–5000	4.06	103	9.06	230	26.37	669	20.00	508	13.00	330	420	190



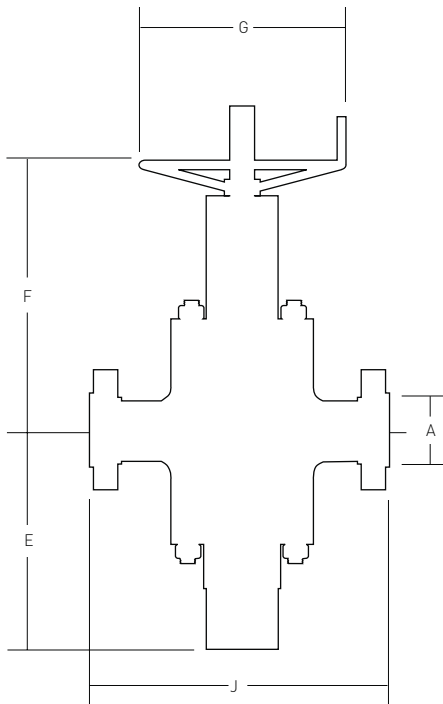
FLANGED END VALVES

SIZE	Working (PSI)	A		E		F		G		J		WT	
		in	mm	in	mm	in	mm	in	mm	in	mm	lbs	kgs
2 1/16	2000	2.06	52	4.81	122	19.25	488	11.00	279	11.62	295	120	54
	3000–5000	2.06	52	5.06	128	19.43	493	13.00	330	14.62	371	125	56
2 3/16	2000	2.56	65	5.62	142	20.18	512	13.00	330	13.12	333	180	81
	3000–5000	2.56	65	5.93	150	20.43	519	16.00	406	16.62	422	220	99
3 1/8	2000	3.12	79	6.93	176	22.50	571	13.00	330	14.12	358	220	99
	3000	3.12	79	7.31	185	22.75	577	16.00	406	17.12	434	300	136
	5000	3.12	79	7.31	185	22.75	577	16.00	406	18.62	437	340	154
4 1/16	2000	4.06	103	8.62	219	25.93	658	16.00	406	17.12	358	360	163
	3000	4.06	103	9.06	230	26.37	669	20.00	508	20.12	511	520	235
	5000	4.06	103	9.06	230	26.37	669	20.00	508	21.62	549	560	254
5 1/8	2000	5.12	130	11.62	295	32.50	825	21.00	533	22.12	561	800	362
	3000	5.12	130	11.62	295	32.50	825	23.50	596	24.12	612	900	408
	5000	5.12	130	11.62	295	32.50	825	23.50	596	28.62	727	980	444
7 1/16	2000	7.06	179	13.87	352	33.10	840	13.00	330	20.00	666	1021	463
	3000	7.06	179	13.87	352	34.10	866	16.00	406	24.00	714	1118	507
	5000	7.06	179	13.87	352	34.10	866	20.00	508	30.00	812	1398	634



DIMENSIONAL DATA

10,000- 15,000 PSI VALVES



- A Valve Bore
- E Bore centerline to bottom of valve
- F Bore centerline to handwheel top
- G Handwheel diameter
- J Flange face to face
- WT Estimated weight

10,000 PSI VALVES

SIZE	J		A		E		F		G		WT	
	in	mm	in	mm	in	mm	in	mm	in	mm	lbs	kgs
1 13/16	18.25	463	1.81	46	14.5	368	21.50	546	12.00	305	280	127
2 1/16	20.50	520	2.06	52	16.00	406	23.00	584	14.00	356	490	222
2 5/16	22.25	565	2.56	65	18.00	635	25.00	635	20.00	508	570	258
3 1/16	24.37	619	3.06	77	21.00	533	29.00	736	22.00	559	850	385
4 1/16	26.37	670	4.06	103	26.50	673	36.00	914	26.00	660	1080	489

15,000 PSI VALVES

SIZE	J		A		E		F		G		WT	
	in	mm	in	mm	in	mm	in	mm	in	mm	lbs	kgs
1 13/16	18.00	457	1.81	46	14.75	374	22.00	558	14.00	356	380	172
2 1/16	19.00	482	2.06	52	16.25	412	23.80	603	18.00	457	520	235
2 5/16	21.00	533	2.56	65	19.00	482	26.50	673	20.00	508	760	344
3 1/16	23.56	598	3.06	77	21.00	539	29.00	762	22.00	584	850	458
4 1/16	29.00	736	4.06	103	26.75	679	36.30	920	26.00	660	1929	585



TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
Will not open or close	Restriction in body cavity	Work handwheel back and forth. If ice is suspected, see procedure below.
Hard to operate	Insufficient lubricant	See lubrication procedure
	Accumulation of mud, sand or other foreign matter in valve body	See draining and lubrication procedure
	Stem thread damaged	Repair or replace
	Gate spring broken or off	Repair or replace
	Pressure in body greater than upstream or downstream pressure	See venting procedure
Restricted bore in valve	Gate not properly aligned with the bore of seats	Stroke valve fully several cycles from full open to full close position
Erratic Operation	Bearing needs to be lubricated	Lubricate bearings
	Bearings are broken	Replace bearings
	Stem threads damaged	Back up from hard operating spot before continuing in one direction. Replace at first opportunity
	Gate spring broken or off	Repair or replace
Leaking bonnet flange	Loose bonnet connection	Isolate from pressure, bleed down cavity and tighten bonnet bolting
	Damaged bonnet seal ring	Replace seal ring
Leaking around stem	Packing and/or stem damaged	Inject with plastic
		Replace packing or stem
Will not seal downstream	Worn or damaged gate and seats	Inject grease in body. Replace seat at first opportunity
Grease fitting leaking	Safety cap not tight	Tighten safety cap or replace fitting when practical.



TROUBLESHOOTING

If ice or hydrates cause the valve not to operate, use the following procedure:

1. Remove the safety cap from the body grease fitting and attach a test pump to the open fitting.
2. Pump methanol or glycol into the valve body to dissolve ice.
3. Work the valve handwheel back and forth to break up the ice block.
4. Continue working the handwheel until the valve can be operated to the fully open and closed position.
5. Remove the test pump and reinstall the safety cap.
6. Drain the test pump and flush the pump hoses clean with hydraulic oil.

