



### Information required

- 1 Bore diameter at seat (use actual diameter if known)
- 2 Differential pressure, using 30 psi minimum, and line psi if higher
- 3 Type of valve and service
- 4 Stem diameter and lead of screw thread (pitch x number of starts)
- 5 Travel time/speed in inches per minute (if critical)

### Examples

12 inch	3 inch	3 inch
200 psi	2250 psi	2250 psi
Wedge gate, oil	Globe, steam	Globe, steam
1 3/4" x 1/3" rising stem	1 1/2 x 1/4" rising rotating	1 1/2" x 1/4" rising stem
About 1 minute		

**Method.** Having obtained the above information proceed as follows:

A	Obtain bore area (full bore assumed) (1)		113 sq in	7.06 sq in	7.06 sq in
B	Differential psi		200 psi	2250 psi	2250 psi
C	Obtain valve factor <b>Table 1</b>	0.35		1.15	1.15
D	Multiply A x B x C to obtain seating thrust		7950 lbf	18200 lbf	18200 lbf
For rising stem valves:			Yes	No	Yes
E	Add packing friction thrust = 2000 x stem diameter (2)		3500 lbf	-----	3000 lbf
For gate valves:			Yes	No	No
F	Add piston effect = 0.785 x diam. of stem <sup>2</sup> x diff. Pressure (For globe valves, the stem area is included with the disc area, so piston effect can be ignored)		481 lbf	-----	-----
G	D + E + F gives total thrust		11931 lbf	18200 lbf	21200 lbf
H	Obtain Stem Factor K <b>Table 2</b>		0.014	0.012	0.012
J	G x H gives torque		<b>167 lbf-ft</b>	218 lbf-ft	<b>254 lbf-ft</b>
For rotating stem valves:			No	Yes	No
K	Add gland friction torque = (1000 x stem diameter <sup>2</sup> ) ÷ 12 (2)		-----	188 lbf-ft	-----
L	J+K gives total thrust (rotating stem)			<b>406 lbf-ft</b>	
M	Actuator RPM = Speed in inches per min ÷ Lead of stem		12 ÷ 1/3 = 36 RPM		

**NOTES:**

- (1) API-600 and API-603 Gate Valves must have full ports according to Annex A form ASME B16.34. Valves conforming to API-602 have reduced ports indicated in this standard. Other valves may differ according to manufacturing standard or published Cv factor. Consult plant for a specific valve port diameter.
- (2) Factors based on Flexible Graphite Packing. For PTFE Packing, the results can be divided by 2
- (3) Valve factors are based on metallic seats, when valve is new. If you foresee seats oxidation or aging during the service, multiply this factors by 1.25 to 1.5, depending the severity of seats oxidation or aging. Stroking the valve frequently, maintain the seats cleaner and the thrust and torque lower.
- (4) For inside screw threads multiply factors by 1.5. For exposed sluice gates (penstocks) multiply factors by 1.25, and insure that thrust estimate is a minimum of three times the weight of the gate. This factors assume a proper lubrication on stem threads, if a poor maintenance is predicted multiply this factors by 1.15 to 1.3. Depending on the specified speed, the stems can have single, double or triple start. Consult plant for actual stem diameter, pitch and lead.

**Table 1 Valve Factors (3)**

Valve type	Liquids		Gases/Steam	
	below 750 F	above 750 F	below 1000 F	above or close 1000 F
Parallel slide and Flexible or double disc	0.28	0.3	0.35	0.45
Solid wedge gate	0.35	0.4	0.45	0.5
Globe above 2"	1.15	1.15	1.15	1.15
Globe below 2"	1.5	1.5	1.5	1.5

**Table 2 Stem Factors (4)**

Factor is lbf-ft per lbf of thrust, for ACME thread, usig a coefficiet of friction equal to 0.14

Lead	Stem dia		in																				
ins	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2	6	6 1/2	
1/8	.006	.007																					
1/5	.007	.008	.010	.011																			
1/4	.007	.009	.010	.012	.013	.015	.016	.018	.019	.021	.022												
2/7	.008	.009	.011	.012	.014	.015	.017	.018	.020	.021	.023												
1/3	.008	.010	.011	.013	.014	.016	.017	.019	.020	.022	.023												
2/5	.009	.010	.012	.013	.015	.016	.018	.019	.021	.022	.024	.025	.027	.028	.030	.031	.033	.034	.036	.037	.040		
1/2		.012	.013	.014	.016	.017	.019	.020	.022	.023	.025	.026	.028	.029	.031	.032	.034	.035	.037	.038	.041		
2/3				.016	.019	.020	.022	.023	.025	.026	.028	.030	.031	.032	.034	.035	.037	.038	.040	.041	.044	.047	
1				.020	.023	.024	.026	.027	.029	.030	.032	.032	.035	.036	.038	.039	.041	.042	.044	.045	.048	.051	
1 1/2												.040	.042	.043	.045	.046	.048	.049	.051	.052	.055	.058	
2													.048	.050	.051	.053	.054	.056	.057	.059	.062	.065	